THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. DECEMBER 31, 1896. CHICAGO, ILL. NUMBER 5

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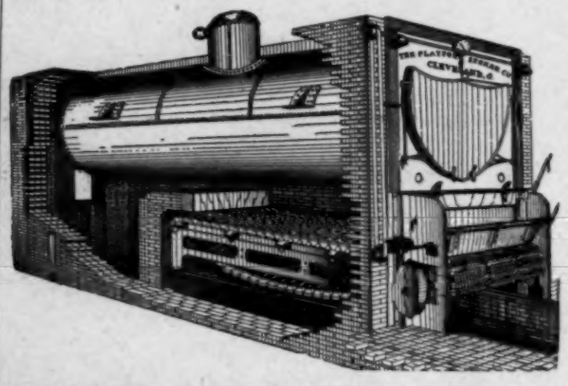
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THE IRON TRADE REVIEW

VOLUME XXIX. CLEVELAND, O. DECEMBER 31, 1896. CHICAGO, ILL. NUMBER 53.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The closing week of 1896 finds weakness in every part of the iron market, and for most products the lowest prices of the year. As in the preceding week, Bessemer steel billets, sheet bars and tin plate bars have monopolized attention, and a number of buyers East and West have covered their requirements for the first half of 1897. Rods have been active also, and in the Chicago district sales to wire mills will insure a six months' run of the Joliet rod mill. Recent announcements involving low-cost possibilities seem to have had an avalanche effect, and in the unsettling incident to the disruption in steel, prices have been crowded down with a vengeance. All sorts of reports are current of extreme prices, and as manufacturers almost exclusively have handled the business, it has naturally had less publicity, in view of the fact that it means little or no profit, than is given transactions through middle hands. On billets $15.50 and $16.25, Pittsburg, represent the range of prices, and on sheet and tin plate bars $17 to $17.50, Pittsburg. In the Cleveland district some business has been done in billets at from $16 to $17, while $18 represents the market on sheet bars, Cleveland delivery. The work of the committee appointed at the New York conference of steel manufacturers Dec. 21 has gone far enough to warrant a call for another meeting in New York on Monday. The scheme under discussion is one that was agitated somewhat, but without action in the early days of the pool—the buying up of allotments of smaller steel works by large producers and the concentration of production. But there are many things in the way of success on this line, and the probabilities of a new agreement that will actually control prices are not strong. It is understood that $18, Pittsburg, is talked of as the price basis. Bessemer pig iron has been carried down in the landslide of the past two weeks and some iron has been let go at prices quite below cost, about 50,000 tons being taken by two Central Western steel works. The lowest figures talked about cannot be confirmed, but it is understood that the $10.25 minimum valley furnace, mentioned last week, is not the lowest point touched. The weak iron lasted but a few days and it is reported that $10.50 iron, valley furnace, is not plentiful to-day, $11.25 Pittsburg being the current quotation, with no business doing. Forge iron has sold down to $9 valley, but there is little demand. Foundry irons share in the prevalent weakness, but quotations are little changed, though there are signs that Southern sellers will not maintain their position of the past two months, Northern irons being relatively much below. Rail buying begins promptly after the reduction of the price, the Pennsylvania Co. taking the lead, as for several years. The order of 40,000 tons, it is understood, covers but part of its requirements. Other Eastern lines are expected to follow. The demand for finished material has simply stopped, pending stock-taking and the making of balances. On some products prices are being quoted in line with the demoralization in steel; but the market is too chaotic for any definite statement. The situation in brief has distinctly the usual last-of-December characteristics, with perhaps more than the usual December unwisdom in the naming of prices.

THE CLEVELAND DISTRICT.

Pig Iron. The largest purchases of Bessemer iron in the past 10 days have been for a Northern Ohio steel plant, the business being divided between Cleveland and the valleys. On the iron from the valleys the price was in the neighborhood of $10.50, at furnace. Deliveries do not begin until March. There are reports of exceedingly low prices on a few lots of valley iron, but the current talk of $10.10 Bessemer, or within $1 of the lowest point ever touched, is not verified. Today $10.50 is the minimum, with little iron to be had at that figure. The average furnaceman asks $11 on spot iron, with from 25 to 50 cents advance on forward deliveries. In the past few days practically nothing has been done and the buying of the week preceding was only induced by the low offers made. It has been evident that cost of raw materials has not entered at all into the account in some of these transactions. Foundry iron is inactive. For all-ore irons the market is $10.50 for No. 2 and $11 for No. 1, in the valley, but some sellers still quote higher. Forge iron in the valley is $9 to $9.25, with no buying. We quote Cleveland deliveries:

Bessemer	$11 15@11 40	Valley Scotch No. 1	$11 65@12 15
No. 1 Strong Foundry	11 65@12 00	Valley Scotch No. 2	11 15@11 40
No. 2 Strong Foundry	11 25@11 50	Gray Forge	9 65@ 9 90
No. 3 Foundry	10 75@11 00	Lake Superior Charcoal	13 50

Billets and Sheet Bars. There has been further buying the past week and in the fortnight Cleveland consumers have contracted for about 20,000 tons of steel. A 5,000-ton transaction, which appears to have been closed through a middleman, was at $15.95, delivered in Cleveland—much the lowest price reported. In another case a 500-ton sale of 1½-inch billets was made at $17.85, delivered. Sheet and tin-plate bars have sold at $18, Cleveland. The prospect of agreement at the New York meeting of steel manufacturers next week is not bright. Concerns that have sold largely of late will not consent to a pool tax on these sales, and those that have sold little will insist on a tax, and agreement will be practically out of the question.

Finished Material. Very little is done by local houses, steel being the only active market. The shafting manufacturers are making an effort to strengthen their position by bringing into the agreement makers of the smaller sizes. Some business is reported in steel bars, but 1c and below, at Pittsburg mill, is not attractive to the average manufacturer. Beams and channels continue at 1.65c, Cleveland; tank plate at 1.15c to 1.20c; bar iron at 1.15c, with the price shaded; No. 27 black sheets at 2.05c to 2.10c.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, Dec. 30.

The most interesting news of the week is that the local steel company has sold sufficient rods to insure the running of the Joliet rod mill until July 1, 1897. The bulk of this business comes from wire manufacturers, and was placed at a price below $25, Joliet. This will take care of a large portion of the billet capacity of the Illinois Steel Co., as the rod mill and merchant mill at Joliet will use all of the product of the Joliet billet mill. In other branches of the iron market the week was dull and uninteresting. Generally speaking, prices of all products except those controlled by associations are inclined to weakness. General conditions in Chicago have been very much unsettled for the last two weeks by the failure of banks which have always been supposed to be of the strongest. These failures have induced, to a certain extent, a lack of confidence in the financial soundness of this part of the country, but it is not thought that anything more serious than has already happened will occur. So far the failures have not affected seriously any concerns connected with the iron business. With the beginning of the new year and the opening of the better business that is counted on, the expectation is that any uneasiness caused by these failures will soon disappear.

PIG IRON.—The market is about as dull as it possibly could be and only a very few small sales are being made. The situation is not expected to improve much before the middle of January, as buyers are not in the habit of placing any very large orders during the holidays and this year has not so far proved an exception in this respect. Furnaces are complaining because consumers are not taking their iron as fast as it was contracted for, but it is thought that conditions will improve in this respect as well as in others shortly after the turn of the year. The local furnaces appear to be maintaining prices exceedingly well on the few sales that are going, but Southern iron is weak and very few if any sales are being made at the quotations last fixed by the Birmingham producers. The market can fairly be said to be at least 25c a ton under quotations of last week on Southern irons, although no specific reductions have been made. We have revised our quotations to more nearly represent the actual conditions:

Lake Sup. Charcoal	$13 50@14 00	Southern No. 2 Soft	$10 90@11 40
Local Coke Fdy. No. 1	11 75@12 25	South'n Silveries No. 1	12 15@12 65
Local Coke Fdy. No. 2	11 25@11 75	South'n Silveries No. 2	11 65@12 15
Local Coke Fdy. No. 3	11 00@11 25	Jackson Co. Silveries	14 00@16 05
Local Scotch Fdy. No. 1	11 75@12 25	Ohio Silveries No. 1	15 00@15 55
Local Scotch Fdy. No. 2	11 25@11 75	Ohio Silveries No. 2	14 50@15 05
Local Scotch Fdy. No. 3	11 00@11 25	Ohio Strong Softeners	14 00@14 28
South'n Coke No. 1	11 65@11 90	Alabama Car Wheel	16 65@17 15
South'n Coke No. 2	11 15@11 40	Malleable Bessemer	12 75@13 50
South'n Coke No. 3	10 90@11 40	Coke Bessemer	13 00@13 50
Southern No. 1 Soft	11 40@11 65		

BAR IRON.—Business in merchant iron is confined to orders for small lots for immediate shipment at the present time, but it is expected that a very much better trade will be had shortly after the beginning of the year. Quotations are made as follows: Common iron, 1.25c to 1.30c; soft steel bars from strictly billet stock, 1.20c to 1.30c.

RAILS AND TRACK SUPPLIES.—Orders for rails have been limited to small lots and probably will continue to be small until early next month. At that time some of the Western roads are expected to make requisitions for considerable tonnage. Prices are made: Rails, $26; splice bars, 1.40c to 1.45c; track bolts with square nuts, 1.95c to 2c; hexagon nuts, 2.05c to 2.10c; spikes, 1.65c to 1.75c.

BILLETS AND RODS.—Sufficient orders were taken last week by the local steel company to run its rod mill at Joliet until July 1, 1897. By far the larger portion of this business came from wire mills. So far only a few small orders for billets have been taken and the local company is not anxious for orders at anything like the low prices prevailing in the East. Some small business which was placed last week was taken at $17.50, which is probably about a dollar a ton above the figure which would be on a parity here with the prices prevailing at Pittsburg. Wire rods are quoted by the local mills at $25 a ton.

STRUCTURAL MATERIAL.—No new business came into the market last week and no large contracts were closed except one for about 1,000 tons of material for the M. K. & T. Railroad. Two or three other contracts which have been in the market for the last ten days will probably be let soon. Quotations are made as follows: Beams and channels, 1.73c to 1.80c; angles, 1.30c to 1.35c; plates, 1.30c to 1.35c; tees, 1.50c to 1.55c. Small lots from stock are quoted ¼c to ½c higher.

PLATES.—Business in this territory has been only of small size, and no increase is looked for before the middle of next month. Prices are inclined to be weak, but quotations are unchanged, as follows: Tank steel, 1.30c to 1.35c; flange steel, 1.50c to 1.60c; fire-box, 2.15c to 5c.

SHEETS.—The market is in a little better condition than it was a week ago, as some fairly good orders have been placed. It is not expected that the better business will continue for any great length of time, however. Quotations are inclined to be weak and are made at 2.20c to 2.25c, for No. 27 black and 80 to 80 and 2½ per cent discount for galvanized.

MERCHANT STEEL.—The market continues to be very quiet and sales have been limited to small lots. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.85c to 1.95c; smooth finished machinery steel, 1.60c to 1.65c; smooth finished tire, 1.55c to 1.65c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—The market is absolutely dead as regards sales to consumers. The only business closed last week involved deals between dealers and these were very few. In the absence of transactions, prices are only nominal. Quotations are made at $13 and $14 for old iron rails; $10 to $11 for old steel rails, and $11.75 to $12.50 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $11.50 to $12; dealer's forge, $10.75 to $11.25; No. 1 mill, $8; heavy cast, $8 to $8.50; malleable cast, $8 to $9.50; axles, $14.75; cast borings, $4; wrought turnings, $5.50; axle turnings, $6 to $6.50; mixed steel, $7.50; stove plates, $5.75; heavy melting steel, $9.25 to $9.75.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, Dec. 30.

Bessemer pig and steel billets show the only trace of life in the iron and steel market. Billet and sheet and tin-plate bar transactions, although greatly exaggerated in current reports, have been considerable, and wants for the first half of next year have been covered by a good many buyers under assured protection against market fluctuations. The feeling has extended to iron and over-anxious speculators have disposed of considerable Bessemer. Two large lots are reported sold at prices highly advantageous to the buyers. A slight stiffening in price naturally followed this activity and quiet again prevails. In every line of finished material the mid-holiday week has been one of extreme quiet, with little effort to transact business.

PIG IRON.—The week has developed in Bessemer pig substantially the same wild conditions prevalent in steel since the declaration of an open market. The change in Bessemer is entirely sympathetic, as the buying has not been for immediate needs and the low figures named are responsible for the bulk of the tonnage taken. Brokers and the selling furnacemen are by no means proud of the prices received, and consequently it is practically impossible to get the size or terms of current sales. It is however stated on authority that two round lots of 28,000 tons and 20,000 tons have been taken respectively, by a Northern Ohio steel interest and a valley concern, at figures variously reported but not authoritatively disclosed. Smaller lots of 5,000, 3,000 and 1,000 tons are currently reported, at prices ranging from $10.50 to $11.25, Pittsburg. The cheaper irons call for prompt delivery, but general contracts run through the first half of 1897. Parties willing to realize at this rate were soon satisfied and the market stiffened at once and is now firm again at $11 to $11.25, Pittsburg. Gray forge has been inactive and has declined slightly, being now held at $9.60 to $9.75, Pittsburg. No life is apparent in foundry iron nor is there perceptible change of prices. Present figures on iron follow, being quoted higher than rates prevailing during the week:

Bessemer	$11.00 to $11.25
No. 1 Foundry	11.50 to 12.00
No. 2 Foundry	11.00 to 11.50
No. 3 Foundry	10.50 to 10.75
Gray Forge	9.65 to 9.75

BILLETS.—Rumors of prodigious sales are still current and the situation has cleared up but little. Naturally the interested parties hesitate to make public details of apparently un-

profitable sales, and consequently little is known in detail. Running contracts for the first half of 1897 have been covered quite generally but price and tonnage are a matter of estimate. Billets are in the neighborhood of $16 and reported sales range from $15.50 to $16.25, according to delivery. Sheet and tin plate bars have been more active than billets, and requirements for the first six months of the year are well covered. Present quotations range from $17 to $17.50 and are well maintained. A sale of 12,000 tin plate bars is announced in the vicinity of $17, 1897 delivery. Rumors regarding the future of the pool indicate the possibility of small allotments being bought up by the stronger interests. The committee appointed by the association was at work upon this problem here last week and will report at the meeting to be held next week in New York.

STRUCTURAL MATERIAL.—An utter lack of interest has pervaded finished lines in general and structural shapes in particular. Fair sized specifications on old contracts have helped to tide over the mills, which are as yet fairly well occupied. A few beams are offered in middle hands from 1.40c to 1.50c. Angles and universal plates are very weak. We quote as follows: Beams and channels, 1.55c; universal plates, 1.15c; angles, 1.10c to 1.15c; tees, 1.35c to 1.40c; zees, 1.30c to 1.35c.

BARS.—Steel bars at 1c are to be had and the common quotations of 1.05c to 1.10c are poorly adhered to. In spite of the attractive prices there is little or no business in sight. Bar iron is in the same condition. We quote the association Cleveland and Youngstown price 1.15c on bar iron. Muck bar is quoted $19.75 to $20.

PLATES.—Tank plate has shown some life in the week and one local mill is booked for some time ahead. Prices are low and 1.10c on tank is shaded in competition. We quote: Tank, 1.10c to 1.20c; shell, 1.25c to 1.30c; flange, 1.35c to 1.40c.

SKELP AND WROUGHT PIPE.—Steel pipe at six tens and iron at five tens and 5 per cent are lifeless. We quote on skelp as follows: Grooved steel skelp, 1.05c to 1.07½c; sheared, 1.17½c to 1.20c; grooved iron skelp, 1.17½c to 1.20c; sheared iron skelp, 1.30c to 1.35c.

SHEETS.—Transactions in billets and slabs have not been followed, as yet, by any movement in black sheets. The market shows some of the same unsettled feeling noted in billets and prices are about as uncertain. Quite low figures are spoken of but no sales at these prices are reported. Tin plate manufacturers are reported to be taking orders under options granted before the recent agreement to abide rigidly by the $3.65, Pittsburg, price on coke plates. Some manufacturers have considerable business. Galvanized sheets are quoted at 80 and 5 per cent off list and are in no demand. On black sheets we quote as follows: No. 26, 2c; No. 27, 2.10c; No. 28, 2.20c.

MERCHANT STEEL.—In merchant steel there is no business whatever and we continue last week's figures: Soft steel bars, 1.20c; machine straightened tire, 1.35c to 1.45c; spring, 1.30c to 1.35c; open hearth spring, 1.55c to 1.60c; machinery, 1.30c to 1.35c; toe chalks, 1.55c to 1.60c; sleigh shoe, 1.45c to 1.50c.

OLD MATERIAL.—We continue former quotations: Wrought scrap, $11 to $11.50; cast scrap, $10 to $10.25; car wheels, $11.50, gross; old steel rails, $13 to $13.25; coil spring, $10.75 to $11, gross; hammered iron axles, $16 to $16.50, net; rolled iron axles, $14 to $14.50; heavy melting stock, $12.50 to $13; machinery cast, $9.75 to $10; car wheels $12.

NEW FORM OF PIG IRON CONTRACT.

The Southern furnaces and their sales agents, as the result of a meeting at Birmingham two weeks ago, have entered into an agreement with each other whereby they will use a uniform style of pig iron sale contract. Heretofore there has been no uniformity in this matter, each furnace and sales agent having an individual form for making a different contract for each different sale according to the terms made with the buyer. It was thought advisable to have all sales from the Southern district made under the same form, and the furnace companies and sales agents have signed an agreement to use the adopted contract in all sales made in the future. There are two forms of the contract, one to be used for cash sales and the other for time sales. The first one reads as follows:

PIG IRON SALE CONTRACT.

No.....

....., 189

SOLD, subject to the following conditions, to

Messrs.....

.....

.....Tons.....Pig Iron,

PRICE: $.....per ton, cash at .....

SHIPMENTS: .....tons per month from.....to.....inclusive.

In case of strikes, combinations of workmen, accidents or repairs involving stoppage of works of either party, shipments may be suspended during continuance of such interruption. Such suspension shall not invalidate contract, but on removal of interruption shipments shall be resumed per contract.

If buyer delays shipments, he shall pay 6 per cent. interest on contract price, less freight, on shipments delayed over 30 days, and two cents per ton per month storage, until iron is ordered shipped; and if buyer's default continue beyond 60 days, furnace company shall have option, upon mailing notice, to cancel such delayed shipments.

If furnace company fails to ship per contract, it shall pay 6 per cent interest on contract price, less freight, on shipments delayed over 30 days; and if furnace company's default continue beyond 60 days, buyer shall have option, upon mailing notice, to cancel such delayed shipments.

DELIVERIES ARE SUBJECT to delays of and in transportation.

REMARKS: .....

.....

.....

By.....Agents.

ACCEPTED, subject to ratification by furnace company:

....., Buyer.

This contract is hereby accepted and ratified.

..... (Furnace Company).

The time sale contract is the same as the one just shown, except that it contains the following clause:

PRICE: $.....per ton delivered on.....at.....

TERMS: Privilege of note dated on arrival of iron by adding 10 cents per ton for two months, 15 cents per ton for three months, 20 cents per ton for four months.

The great evil from which Southern sellers of pig iron have suffered is the holding back of iron taken under explicit contract for specified deliveries. So lax has the practice become that buyers of iron for forward deliveries have deferred shipments at pleasure, and calculations by the seller have been made quite impossible. The new contract is business-like and fair to both sides, and some of its features might well be copied in other districts.

Carnegie Steel Co's Wage Scale Continues.

Upwards of 6,000 men are directly affected by the notice concerning wages at the works of the Carnegie Steel Co., Ltd., posted on Thursday, Dec. 24. It is addressed to the employes at the Edgar Thomson Furnaces, Edgar Thomson Foundry, Edgar Thomson Steel Works, Duquesne Furnaces, Duquesne Steel Works, Homestead Steel Works, Lucy Furnaces, Keystone Bridge Works, Upper Union Mills, and Lower Union Mills, and affects directly about 6,000 workmen. The notice reads:

"We withdraw notice of Sept. 30, 1896, of revised wage scales to begin Jan. 1, 1897. The 1895-6 wage scales and wage agreement will remain in force during 1897. Notice of May 14, 1895, reading: 'Until further notice the scale rates paid to all tonnage, day and turn men will be increased ten per cent; this without prejudice to the 1895 wages agreement, still in force,' will remain in force until further notice.

"The present condition of the iron and steel business does not warrant this continuance of the payment of the bonus, but we hope that early in 1897 there will come such improvements as to do so, and it is this hope which has led us to continue its payment."

THE tin mills at the plant of the Lalance & Grosjean Mfg. Co., Harrisburg, Pa., will be idle for several weeks yet, as the management is reorganizing the force.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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1896 IN THE IRON TRADE.

The year just closing has been disappointing to the iron trade of the United States. Measured by pig iron production, its record has been exceeded by but three years in our history—1890, 1892 and 1895. In respect to volume of business and profits, it fell much behind 1895, though it was better than 1893 and 1894. It will be remembered chiefly as the year of pools in iron and steel, and its history could be largely summed up in a chronicle of their vicissitudes. The expected reaction from the boom of 1895 was of itself a crucial test of the stability of the industry, but this was reinforced by a most serious assault upon the financial integrity of the country, that shook the very foundations of business. The wonder is, as we look back upon the devious road through which the iron trade has come in the twelve-month, that so few have fallen by the way. Not a failure has occurred that has involved any concern of prominence. The aversion of disaster, though a negative thing, really becomes the most positive feature of the year, when the experiences of the later summer and early autumn months pass in review.

The general verdict on the year's experiences with pools will be unfavorable. The producers of Lake Superior Bessemer ores were successful in maintaining their prices, which were based on $4 for standard Gogebic ores. The sale of 5,000,000 tons of Bessemers under the conditions prevailing is perhaps not a record to complain of. Early in the year there was serious talk of a pool arrangement on non-Bessemer ores, but the factors involved, including the ever-pressing competition of Southern iron, were so various and so difficult of control, that the proposal was abandoned. These ores, however, brought from 50 to 75 cents above the basis of 1895 in early sales. Later in the season, there was a drop of from 25 to 40 cents, but the extreme figures of the two years preceding, even on Mesabi non-Bessemers, were not touched.

The steel rail manufacturers, like the Bessemer ore companies, succeeded in holding their price, albeit the tonnage was small, the railroads keeping aloof because of dissatisfaction with the pool figure.

The billet pool, in its eight months' career as a maker of prices, met few of the expectations of its projectors. From early April to early December its price remained unchanged at $20.25, Pittsburg, though all the time a certain amount of steel was obtainable at figures from 25 cents to $1 below this basis. The causes of its collapse are fresh in mind. The predictions made at its inception, that it would result in throwing the control of the finished material market into the hands of the large steel producers, and compel small concerns buying billets in the market to stop rolling steel, were fulfilled. Steel bars were sold below the pool price for billets. Concerns requiring steel billets, slabs and sheet and tin plate bars bought in a stinted way and kept close to their requirements. What would have been the rule had free competition prevailed in steel is shown in the heavy contracts for steel in the past two or three weeks, which mean unprofitable operation for most of the sellers for some months to come. If a good demand springs up in the next three months, many concerns will be burdened, as they were in the early part of 1895, with profitless business, while otherwise they would have been prepared for desirable orders as soon as they came upon the market. It is hard to judge of the validity of the claim that the billet pool has saved the finished material market from demoralization far more serious than it has seen. Perhaps the one feature of its operation that indirectly exercised most restraint upon buying was the uncertain feeling as to its tenure, due to repeated reports of dissatisfaction. This caused buyers of finished material to limit their purchases—a policy made doubly compulsory after the Chicago convention—and the result was that in the second half of the year there was at no time business enough in sight to cause sharp price cutting on mill products. The year ends with a serious effort making for the reconstruction of the billet pool on a new price basis, after three weeks of open prices, in which $15.50, Pittsburg, has been touched.

The Merchant Bar Iron Association has probably been the busiest of the pools, so far as meetings are concerned, from a dozen to fifteen having been held in the year in different parts of the country. The January price was 1.20c, Cleveland, followed by 1.25c in February, and in the next two months there was some irregularity, with well-grounded reports that the agreed price was being cut within as well as without the association. While no formal dissolution took place, the association became inoperative as a controller of prices. In the second week in April, however, a stronger arrangement was perfected, and 92 per cent of the bar mill tonnage west of Pittsburg was brought into the association, which was established on the regulation pool basis, with forfeits, tonnage tax and percentage allotments. A 1.20c Cleveland and Youngstown price was fixed and up to October was quite well adhered to. Then, by action of the association, members were allowed to cut to 1.05c, Cleveland, by means of a rebate. In November a 1.15c basis was fixed and is in force to-day, though it appears not to be inflexible.

The beam agreement which has been operative since early in May, with the exception of three or four weeks in the latter part of November and the early part of December, did not take on regulation pool features until two weeks ago, when a meeting in New York resulted in the adoption of percentage allotments. At the beginning of the year 1.50c, Pittsburg, was the price; this fell to 1.45c, then to 1.40c; in February 1.50c was again established. This basis was held, with the exception of a few incursions into Central Western territory by Eastern mills. In May an agreement was reached between the leading producers, and 1.55c, Pittsburg, was held until the break in the latter part of November.

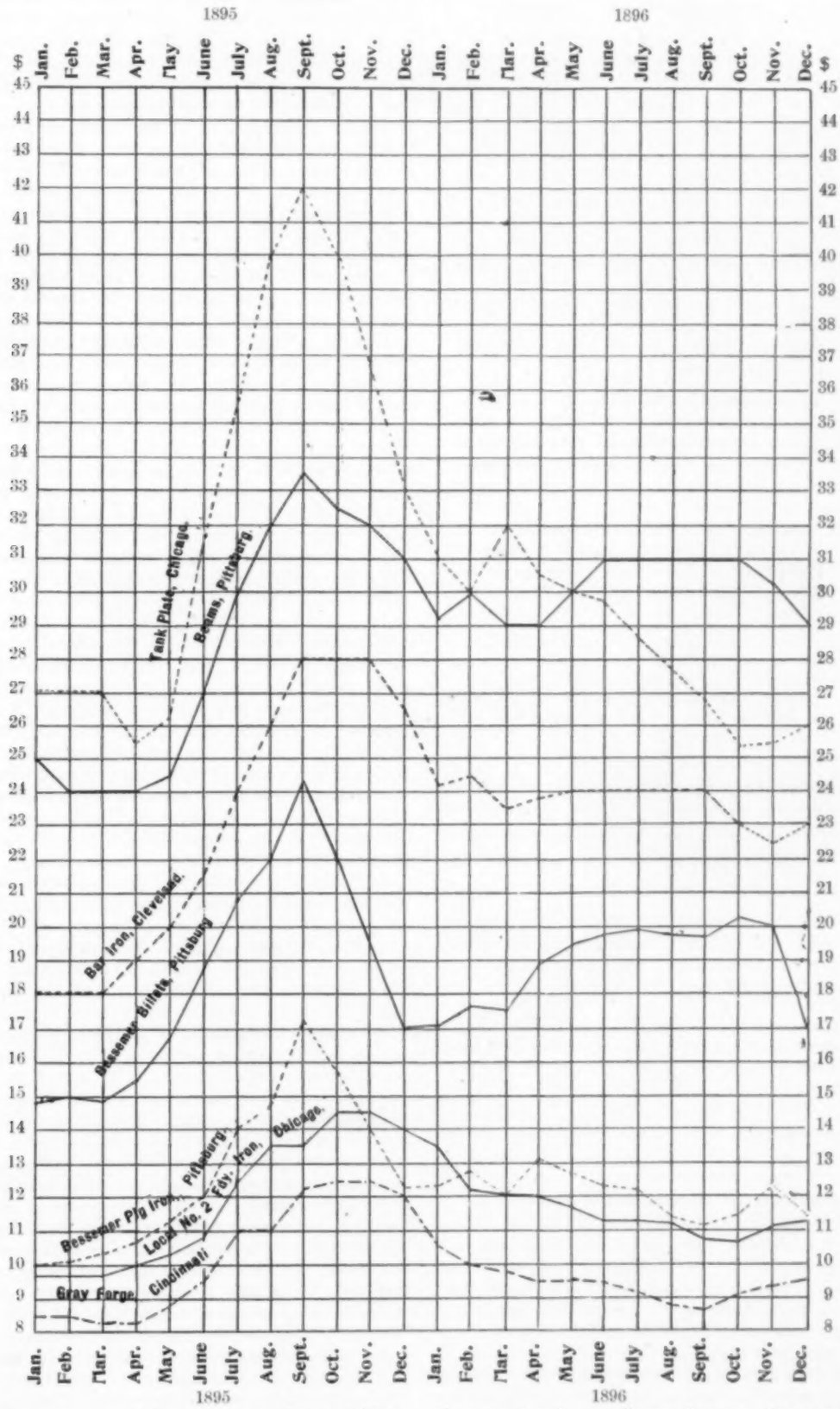
The nail pool, which started in May, 1895, entered 1896 on a $2.25 basis, Pittsburg, for wire nails in carload lots. This was advanced in two bounds to $2.55, which was the price when the pool collapsed, in the first week of December.

Mention should also be made of the agreement entered into in April by producers of Lake Superior charcoal iron, which has been maintained, substantially, through the year on the basis of $13.50 for delivery at lake ports. The furnacemen of the Mahoning and Shenango valleys agitated a proposal for an agreement fixing prices and restricting output, but nothing came of it. Pig iron producers of Pennsylvania and Ohio were invited to a conference at Philadelphia, July 15, to consider a proposition to organize for the limitation of output and the prevention of demoralization, but only Eastern Pennsylvania furnacemen attended. Further effort was made at a later date, but without result.

The Year in Pig Iron.

The official statistics of pig iron production in 1896 are yet to be collected, but it is possible to approximate, with the

help of the exact figures for the first half of the year—4,976,236 tons—and the statistics of active blast furnaces on the first of each subsequent month. These data would indicate an output close to 8,700,000 tons for the year. The monthly statements of blast furnace capacity active are interesting, as they reflect the apparent unwillingness of furnacemen to believe that 1896 would not be a good year. January started off at a hope that they could remain in blast even through a Presidential campaign, because they regarded the result as foregone, the shifting of the issues had been a storm signal. They governed themselves accordingly. The restriction of production was still more pronounced in September, and in October the low mark of the year was reached. The Mahoning and Shenango valleys, with their total of 27 furnaces showed



10¾-million rate per year. February 1 showed some falling off, but at the beginning of each of the next five months the returns indicated a weekly production over 180,000, or a yearly rate of considerably over 9,000,000 tons. But the Chicago convention decided the matter. The August furnace reports showed that to many furnacemen, who had held out in the the most heroic curtailment, but two furnaces in each being in blast through most of September and October. After the election there was a starting up of some of the idle stacks, and by Dec. 1 the annual rate of production had increased 1,600,000 tons over Oct. 1, the two valleys and Pittsburg contributing largely to the movement. We append the state-

ment of active blast furnace capacity at the beginning of each month of the year, putting in another column the corresponding annual ratein gross tons:

January	207,481	10,790,000
February	198,599	10,325,000
March	189,583	9,860,000
April	187,451	9,750,000
May	189,398	9,850,000
June	182,220	9,475,000
July	180,532	9,385,000
August	157,078	8,170,000
September	129,500	6,735,000
October	112,782	5,865,000
November	124,177	6,455,000
December	142,278	7,400,000

Stocks of pig iron in the hands of makers increased steadily from the opening of the year to Nov. 1, when they exceeded 1,000,000 tons. A slight reduction was noted in the following month, but with production further increased and demand light, the prospect is not promising for such a change as is needed. In the Birmingham district some of the surplus was worked off at low prices to speculative buyers and as a result warrant yard stocks were increased from 106,200 tons Jan. 1, 1896, to 199,200 tons by the last December report. Exports of Alabama iron to European ports also cut some figure. Ballast freight rates made this possible and the total is estimated at 50,000 tons for the twelve months.

Fluctuations in Prices.

The accompanying diagram indicates the changes in prices of representative products in 1895 and 1896. The average of weekly quotations is taken for each month and the intersections of the traversing lines with the vertical lines represent the price average for the months opposite the latter. In marked contrast with the sharp advances apparent in the boom period of 1895 is the moderate compass of the lines for the past year. The prices given for tank plate, beams and bar iron are for net tons. The table of averages from which the 1896 lines are plotted is as follows:

AVERAGE PRICES ON CERTAIN IRON AND STEEL PRODUCTS FOR EACH MONTH IN 1896.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Local No. 2 Fdy., Chicago	13.50	12.25	12.00	12.00	11.75	11.25	11.25	11.20	10.80	10.75	11.10	11.25
Gray Forge, Cincinnati	10.60	10.00	9.85	9.50	9.50	9.40	9.10	8.75	8.65	9.10	9.35	9.50
Tank Plate, Chi., net ton	31.00	30.00	32.00	30.50	30.00	29.75	28.60	27.75	26.75	25.40	25.50	26.00
Billets, Pittsburg	17.05	17.65	17.50	18.90	19.50	19.75	19.90	19.75	19.60	20.25	20.00	17.00
Beams, Pittsburg, net ton	29.20	30.00	29.00	29.00	30.00	31.00	31.00	31.00	31.00	31.00	30.25	29.00
Bessemer, Pittsburg	12.30	12.80	12.00	13.15	12.75	12.40	12.20	11.45	11.25	11.50	12.30	11.40
Bar Iron, Cleveland, net ton	24.20	24.50	23.50	23.75	24.00	24.00	24.00	24.00	24.00	23.00	22.50	23 00

In the table below the prices at the beginning and end of the year, and for the lowest and highest weeks of the year are given for the same products:

	Jan. 1, 1896.	Lowest Week, 1896.	Highest Week, 1896.	Dec. 31, 1896.
Local No. 2 Fdy. Iron, Chicago	$13.75	$10.75	$13.75	$11.25
Gray Forge, Cincinnati	$10.50	$ 8.65	$10.75	$ 9.50
Tank Plate, Chicago	1.60c	1.25c	1.60c	1.25c
Billets, Pittsburg	$16.25	$15.25	$20.25	$15.25
Beams, Pittsburg	1.50c	1.25c	1.55c	1.55c
Bessemer Pig, Pittsburg	$10.75	$10.75	$13.50	$11.15
Bar Iron, Cleveland	1.25c	1.05c	1.25c	1.15c

THE CHICAGO IRON MARKET IN 1896.

Taken as a whole the year has been quiet, and until the last few weeks was devoid of any sensational features. The range of values has been neither so high nor so low as in 1895. This is due to a large extent to the various associations and pools which have controlled several branches of the iron and steel market, holding it very nearly stationary for a considerable length of time. The total amount of business closed in the year was probably short of that closed in 1895, which had the temporary stimulus of the boom, but there is no great difference in the tonnage for the two years. The low prices prevailing on some products and the depression at home have been an incentive to manufacturers to seek markets abroad, and as a consequence a larger foreign trade has been had than in previous years. The mills and furnaces of the country at no time in the year have been employed to their full capacity, approaching nearest to this condition in the first few months. During the first six months general conditions were very favorable for a large year's business and the popular impression was that 1896 would be very much more prosperous than the two or three years immediately preceding. The Chicago convention in July was responsible for the depression which followed. Manufacturers feared for several weeks after the convention that the policy outlined there would be adopted at the November election, as a strong sentiment developed in July and August in favor of free silver coinage. The good sense of the people came to the rescue in November but it was then too late in the year to expect any marked revival in business. A considerable tonnage of iron and steel was placed in the two or three weeks immediately following the election, but the balance of the year has been quiet.

In pig iron the first two or three weeks of the year showed little business; but it began to increase about the end of January. Prices at first were weak, but as a matter of fact quotations on most products were higher at the beginning of the year than at any time since. Local irons dropped slowly but steadily in value throughout the year until November, when they recovered slightly, and at the close of the year are at least $1.50 higher than the lowest point touched. Until October, Southern No. 2 foundry iron was from 25c to $1 lower than the same grade of Northern iron, but from October on, the relative positions were reversed and Northern iron sold at a lower figure than Southern. In the first half of the year Southern furnaces took a fair share of the business in Chicago territory, but in the last six months Northern iron sold much the larger proportion of the tonnage closed. The Birmingham furnaces made an agreement as to prices which lasted during most of the first six months, but in July outside competition from other Southern furnaces became so lively as to force the Birmingham producers to reduce their quotations to meet the market, and the combination has been a dead letter since then, though the larger companies have adhered to a basis fixed in early fall. In the latter part of August several very large sales of Southern iron were made to Eastern speculative buyers, the iron to go into storage warrant yards. The total of these sales was close to 100,000 tons. Most of this has been delivered to storage yards and but very little has been sold to the consumer. The sale of this iron had the effect of stiffening the market for Southern iron to some extent and the advances made in September have not been lost at the end of the year. The pig iron market has been quiet all through December and the close of the year finds it inactive but with furnaces holding very firm views as to values.

At the beginning of the year the demand for building material was larger than that for any other class of finished product and several contracts of considerable size were placed in January. Railroads placed considerable orders for bridge building purposes and quite a large tonnage was given out for track elevation and for structural work for the elevated railroads. The last week of January the South Works of the Illinois Steel Co. started up on double turn, running on billets and rails. The first week in February the Union Works and the Joliet mill of the Illinois Steel Co. started up on billets and the Joliet rod mill commenced work at the same time. Car manufacturers placed considerable orders for bar iron in the first two or three months of the year. Prices on this material, which at the beginning were inclined to be weak because the Merchant Bar Iron Association did not include all of the bar mills of the country, were very much strengthened the latter part of February, when some of the outside mills were induced to come into the association or at least co-operate with it. In the last two weeks of March and the first of April the bar mills broke away from the Association again and prices were made quite a good deal below the agreed figures. The Association was successful in April, however, in reorganizing on a firmer basis than ever, and the price was put at 1.30c, Chicago, at which it was maintained until October. An interval of prices from $2 to $3 lower followed and early in November 1.25c, Chicago, was established.

The billet mills succeeded, in April, in forming an association which took in all but one of the billet producers in the country. The association price was set at $21.25, Chicago. During the year complaints were made at various times by some of the smaller members of the billet pool, but each time

the complaining members were satisfied, until in the early part of December. One of the Wheeling district mills then withdrew absolutely from the association, causing its collapse as a maker of prices. At a meeting of the pool held after the announcement of this withdrawal, it was determined to maintain the form of organization, but it was impossible to re-establish prices.

In the early part of June some trouble was experienced by the local steel company with its men at the Union Works, which caused the shutting down of that plant. It was expected that the shutdown would be only temporary, but as looked-for business failed to materialize the closing was made permanent and the mills did not run again throughout the year. On the first of July the Bay View mills of the Illinois Steel Co. shut down for two weeks and the rod mill at Joliet for an indefinite time to settle wage scales. In August the Illinois Steel Co. leased the bar mill at East Chicago, Ind., of the East Chicago Iron & Steel Co., which had failed some time previous. This mill was not then in operation and has not been run since then. On September 15 the rod mill at Joliet started up and ran continuously to the end of the year. The rail mill at South Chicago shut down the middle of October and has not been running since.

November showed a good business in structural material, several large building contracts being placed just before the election and orders having been taken for a considerable tonnage from bridge builders. The demand for plates also increased considerably and the orders which were placed, which included large lots from the ship-building concerns, were sufficient to warrant the starting of the South Chicago plate mill. This mill has continued in operation up to the present time. The disruption of the billet pool, coming at the end of the year, unsettled the market completely and caused buyers of finished material who had contracts under consideration, to postpone giving their orders. Meantime, however, some liberal purchases were made in the Central West of billets and sheet and tin plate bars.

The range of values in Chicago in the past year is shown by the following table of prices, which gives the averages of the months:

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Lake Superior Charcoal	14.50	13.75	13.50	13.50	13.50	13.50	13.50	13 50	13.50	13.50	13.50	13.50
Northern No. 2 Foundry	13.60	12.35	12.00	12.00	11.75	11.25	11.25	11.20	10.80	10.75	11.10	11.25
Southern No. 2 Foundry	12.60	12.35	11.65	11.50	11.60	11.35	10.85	10.60	10.60	10.85	11.30	11.40
Bars	26.00	26.50	26.00	25.50	26.00	26.00	26.00	26.00	26.00	25.40	23.00	24.50
Rails	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00	28.25
Beams	34.60	33.00	34.00	33.00	34.00	34.75	34.00	34.00	34.00	34.00	34.00	31.25
Tank Plates	31.00	30.00	32.00	30 50	30.00	29.75	28 60	27.75	26.75	25.40	25.50	26.00
Billets	18.75	19.75	19.50	21.25	21.25	21.25	21.25	21.25	21.25	21.25	21.25	20.15
Sheets, No. 27	47.00	45.00	47.00	46.20	46.00	46.00	45.60	44.00	43.00	43.60	45.00	45.00

DEATH OF JOSEPH D. WEEKS.

The announcement of the sudden death of Mr. Joseph D. Weeks at Pittsburg on Saturday, Dec. 26, was heard with deep regret in the professional and business circles with which Mr. Weeks had been closely identified for many years. Mr. Weeks had started from the editorial rooms of the *American Manufacturer*, Saturday afternoon, after preparing some copy for his paper, but was stricken down with apoplexy as he was going from the building. He was taken to his home and died early in the evening, never regaining consciousness.

Mr. Weeks's reputation as a statistician and an investigator in industrial and economic lines was national. Known best to the iron and steel world as editor of the *American Manufacturer*, his research and his writing extended into many fields, related on the one hand to metallurgy and on the other to political and industrial economy. Born in Lowell, Mass., in 1840, he was employed as a boy in the woolen mills of that town. He was a teacher in Vermont as a young man, and graduated from Wesleyan University, Middletown, Conn. Later he preached for eight years in the Methodist Episcopal Church in New England, but gave up the ministry on account of a throat trouble.

His residence in Pittsburg dates from a few years after the war. In the seventies he was appointed a commissioner by Governor Hartranft, of Pennsylvania, to investigate the trade union movement in Europe, with a view to throwing light on the proposal made in Pennsylvania for the establishment of a tribunal of arbitration for the adjustment of labor difficulties. The result of these investigations were publised in a pamphlet entitled "Arbitration and Conciliation." On the merging of the various iron and steel trades unions into the Amalgamated Association in 1878, Mr. Weeks represented the manufacturers in the preparation of wage schedules. For several years he was the Pittsburg representative of the *Iron Age*, and at the organization of the Western Pig Iron Association became its secretary, holding that position and collecting its statistics ever since. From 1886, annual contributions were made by Mr. Weeks to the reports of the U. S. Geological Survey, the papers on coke, natural gas, petroleum and manganese being his. In the summer of 1894 he made a trip to Europe to investigate the retort systems of coke making, with by-product recovery, going with credentials of the Geological Survey. Census statistics relating to the gas, petroleum and coke industries were prepared by him for the volumes of 1880 and 1890. Mr. Weeks had membership in the American Institute of Mining Engineers, the American Society for the Advancement of Science, the American Association of Gas Engineers and American Iron and Steel Association. As president of the American Institute of Mining Engineers, he delivered addresses at the Atlanta meeting in 1895 and the Pittsburg meeting in February, 1896, his paper at the latter presenting the claims of William Kelly to the title of discoverer of the pneumatic process of steel-making. It called forth replies from Sir Henry Bessemer and his friends, and the controversy was doubtless the occasion of the elaborate paper by Sir Henry, on the Bessemer process, presented at the meeting of the American Society of Mechanical Engineers at New York in December. Mr. Weeks wrote much in advocacy of a protective tariff, his principal pamphlet being entitled "The Protective Tariff and Wages."

In 1881 Mr. Weeks secured a majority interest in the *American Manufacturer* and the *Iron World* and consolidated the two publications, editing and controlling the paper ever since.

In addition to what is noted above something of the range of Mr. Weeks's activities is indicated in his connection in recent years with the Pennsylvania Tax Commission, for which he has conducted investigations and prepared reports; his service as expert in the Government condemnation of the Monongahela Navigation Co.'s dams, and his active membership in various charitable and fraternal organizations. He was a member of Christ Methodist Episcopal Church, Pittsburg. His wife and a daughter survive him.

FIRE at the plant of the Shoenberger Steel Co., Pittsburg, last Sunday, damaged the pattern and general machine shop to the extent of $10,000. It will be rebuilt at once.

NEW SPECIFICATIONS FOR NAVAL STEEL.

The report of the steel investigation board delegated by the Navy Department to examine the armor plate furnished for the battleships Kentucky and Kearsarge, has been made to Secretary Herbert. It says that many tests of the plates were made at Newport News and the Norfolk Navy Yard, and that of the specimens tested, two-thirds did not fulfill the requirements of the bending qualities, one-fifth in elongation, one-half in quenching and one-tenth in tensile strength. The board recommends that the 96 bracket plates for the ships be rejected by the department but that the 500 tons of hull plates be allowed to remain on account of the delay in the construction of the ships, which would follow if they were rejected. In regard to the 4,700 tons of armor furnished for the ship Illinois, the board makes no suggestions, but 72 specimens of this plate have been selected and will be taken to the Washington Navy Yard for tests. It is probable that the board will go to Philadelphia also and examine the steel supplied for the Alabama.

In connection with this report of the investigating board, it is stated that a communication has also been sent to the Secretary of the Navy by the standing naval steel board, which recommends changes in the specifications for bracket plates and hull plates. While the placing of responsibility for the unsatisfactory tests recently made rests with the Naval Secretary, it is plain that the investigating, as well as the naval steel board, put the onus upon the specifications. The principal change recommended is a requirement that all steel for the purposes mentioned be annealed. With this treatment it will be possible to have the required tensile strength and at the same time ductility and elongation.

National Association of Manufacturers' Convent on.

The executive committee of the National Association of Manufacturers met in Philadelphia, Dec. 18. The proceedings were preparatory to the annual convention which will occur in Philadelpia on Jan. 26, 27, and 28, 1897. The convention will be held in the new Horticultural Hall, which will provide ample accommodation for a large assembly. The executive committee extends an invitation to all manufacturers of the United States, members or non-members, to attend this convention. Those holding certificates of membership will be entitled to the privileges of debate and voting.

Another important matter dealt with by the executive committee was the adoption of the following resolutions:

"That it is the sense of this executive committee that the tariff laws should be revised at the earliest possible moment, in order that uncertainty be removed, confidence restored, and business permitted to revive.

"That rates of duties should be made as low as possible, consistent with the fair protection of our industries and the labor they employ."

During the convention a number of interesting addresses will be delivered by men of national repute.

Organization of the Carnegie Road Completed.

Directors of both the Butler & Pittsburg and the Pittsburg, Shenango & Lake Erie roads have met in the past week and passed resolutions for the merging of the two companies under the name of the Pittsburg, Bessemer & Lake Erie. Col. Samuel B. Dick, now president of the Shenango road, has been nominated as chairman of the board of directors of the consolidated company. James H. Reed, of Pittsburg, now chairman of the Butler & Pittsburg, has been nominated as president; J. T. Odell, vice-president; Thomas H. Given, treasurer, and Robert A. Franks, secretary. These men will be formally elected at a stockholders' meeting to be held later. The following board of directors for the Pittsburg, Bessemer & Lake Erie was sanctioned: Andrew Carnegie, J. Edward Simmons, New York; Samuel B. Dick, Meadville; Gen. A. C. Huidekoper Meadville; John Dick, Meadville; H. C. Frick, chairman, and John G. A. Leishman, president of the Carnegie Steel Co.; James H. Reed, J. T. Odell, T. H. Given and A. W. Mellon, Pittsburg; Edwin S. Mills, of Cleveland, and T. H. Wells, Youngstown. The capital stock of the new company will be $10,000,000, divided into 200,000 shares of a par value of $50 each. Included in the articles of consolidation is an agreement with Andrew Carnegie in which he pledges at least 2,000,000, tons of ore from Conneaut harbor annually. The rate will be 76 cents per ton. The present charge is $1.15.

The line from Butler to Pittsburg will be completed by Aug. 1, 1897. The entire line from the lake port will be laid with 100-lb. rails. The cars will be 40-ton, and the locomotives the most modern. The maximum grade is 30 feet to the mile, and over 80 per cent of the line will be straight track. Col. S. B. Dick says of the possibilities of the line: "As an evidence of what we expect to do, we hauled, yesterday, north of Greenville, 59 cars with 1,500 tons of coal, and returned with 45 cars having 1,300 tons of ore, with one engine and one crew, with the exception of having a pusher over one small grade that has not been reduced. It is the intention to make this line the model heavy freight line of the country, its principal tonnage being iron ore south and coal north. We have contracts for a term of years which will insure us a tonnage of 4,000,000 tons annually, the increase of which only depends on our ability to carry."

THE apparatus for casting and conveying pig iron, invented by Ed. A. Uehling, of Uehling, Steinbart & Co., Newark, N. J., has been in successful operation at one of the Lucy furnaces of the Carnegie Steel Co., Ltd., at Pittsburg, since August, and the capacity of the apparatus is to be increased to take care of the output of both furnaces. It casts in chills and thus gives a sandless iron. The cost of handling the iron with the continuous traveling molds and conveyor is said to be about half that involved in the method of casting in sand. The apparatus loads the iron on cars without the touching of a pig by hand. It has been inspected at Pittsburg by a number of furnacemen and arrangements are being made for its introduction at one or two valley furnaces. James W. Miller, 831 Carnegie Bldg., Pittsburg, is special agent for the Uehling method.

A CASE of prompt recuperation and of the quick handling of an order is furnished in the rehabilitation of the Newark, N. J., Electric Light Works. A fire on Tuesday night, Dec. 29, destroyed 37 dynamos and left the city in darkness so far as electric illumination was concerned. Long distance telephoning in various directions led to the placing of an order before morning of Wednesday with the Brush Electric Co., of Cleveland. Early Wednesday afternoon a special train of nine cars of machinery was started from Cleveland over the Pennsylvania Road, and the expectation was that some of it would be in place furnishing light for a portion of the city of Newark on Thursday night.

A NUMBER of furnaces in the valleys are making extraordinary records of output. It was noted a week ago that Hannah furnace of the Mahoning Valley Iron Co., 75 x 16 feet, had made 278 tons of iron in 24 hours. Struthers furnace, also 75 x 16 feet, has exceeded this, making in one 24-hour period 285 tons. In the first 15 days of December the output was 3,553, a daily average of 237 tons of 2,300 lbs., or 240 tons of 2,268 lbs.

THE Wheeler Projectile Co., of Pittsburg, was chartered at Harrisburg on Monday of this week. The company is capitalized at $350,000, and its charter grants the right to manufacture armor and armor piercing projectiles. The directosr are Charles M. Mackey, New York; James W. Rowland, Franklin, Pa.; James H. Willock, Pittsburg, and Austin A. Wheelock, New York.

THE Excelsior Machine & Boiler Works Co., of Chicago, made an assignment, Dec. 28, to the Equitable Trust Co. The assets are $40,000 and the liabilities are about the same. The company manufactures boilers and machinery. The cause assigned is the general business depression.

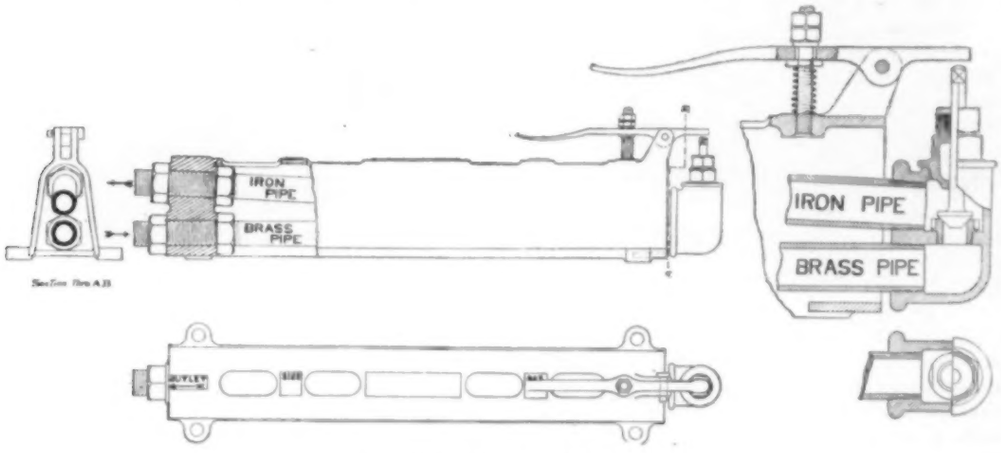
WE acknowledge the receipt of a pamphlet reprint of the paper on "American and English Methods of Manufacturing Steel Plates," read by Mr. Jeremiah Head before the Institution of Civil Engineers in May. A synopsis of the paper was given in our issue of June 11.

GEIPEL'S PATENT STEAM TRAP.

The illustration shows the Geipel steam trap with the valve free to open and discharge. Heat expands and lengthens the brass pipe, causing the valve to rise and closing it against the lever. The reduced temperature of water contracts the tube, causing the valve to fall away from the lever, allowing it to open. Thus when there is water in the brass pipe the valve will always be open, and when there is steam it will always be closed. Thus the trap is capable of delivering a stream of water equal to the full bore of the pipe, if water in sufficient quantity is present to be removed.

The only working part to this trap is the valve, and that can be seen rising and falling as the trap performs its duties. By pressing down upon the lever the resistance to the valve opening is removed and means is thus afforded of blowing through when necessary. As the trap consists only of two tubes there is no place in which scale or dirt can lodge. If placed upside down it will drain entirely dry, and thus cannot freeze.

This trap has been attached direct to the jackets of steam engines and being compact in form may be placed on an engine base plate. It has been largely used in connection with heavy pressures and works equally well at a pressure of one pound per square inch. A number of shipbuilding companies abroad use the Geipel trap, and among engine builders Willans & Robinson, makers of the Willans engine. The manufacturers are Thorpe, Platt & Co., 97 Cedar street, New York.



GEIPEL'S PATENT STEAM TRAP.

Retort Coking System in the South.

In an interesting article contributed to Christmas *Dixie*, on "The Southern Coke Industry,' Mr. Wm. M. Brewer says this, in his concluding paragraph, relative to the probabilities of erecting ovens that will permit the recovery of by-products in connection with the coking of Southern coals:

"Of course there is no doubt but that a vast amount of money has been lost in the past by allowing the by-products of the coke ovens to be wasted; but the age of by-product ovens has not yet in the United States, gone beyond that of infancy, and all who are interested in the manufacture of coke are anxiously watching the results from the few plants which have already been erected on this side of the Atlantic. Should these prove entirely satisfactory, then there is no doubt but that the Birmingham district will adopt all up-to-date improvements. In the meantime the iron masters are contenting themselves with the use of the bee-hive ovens. To change from these to any of the by-product savers, would mean a vast outlay of capital, as well as the entire abandonment of the plants already in existence.

" When this question comes up for consideration, there are very many features which present themselves to the mind of the conservative business man. The most thorough and exhaustive investigation of the value of the by-products per ton of coke, is, of course, of the first importance, because from the figures obtained from such an investigation, depends the advisability of abandoning the old practice entirely and adopting the new. A thorough examination also would be necessary as to the adaptability of the Alabama coals for coking in these more modern ovens. The question would also arise as to how the grade of coke made in these ovens would compare with that now produced in the bee-hive ovens. Another question which would present itself would be as to the quantity of coke required per ton of pig iron produced, and the comparisons between that quantity, and such as is now used would have to be made.

" It will be seen, therefore, that before we can expect to see the erection of by-product ovens in Birmingham, or any other coke district, very careful laboratory work would have to be done. The chemists for the various iron companies are all improving their laboratory practice with regard to metallurgy of coke, and from the results of such work will depend, of course, to a great extent, the course which will be taken by the iron masters."

One View of the Business of 1896.

The Joseph Dixon Crucible Co., Jersey City, N. J., makes this resume of the business experience of 1896 from its standpoint:

" In looking back over the year 1896, there is no denying some of the facts which show out very clearly. The volume of our business has been less than in 1895, though not so very much less. We were hopeful of better business up to the time when the money question entered politics, and was followed by its train of uncertainties and want of confidence. Accounts have been hard to collect, although we believe our customers have been anxious to pay promptly. We know they have written us manly and business-like letters which made us confident of their honesty, and showed us how exceedingly hard it was to get hold of ready cash. Notes were of course often sent us, but, as renewals rather than payments were almost certain to be expected, the notes could not safely be negotiated.

"Altogether our experience is that 1896 has been a season of hard times and many moments of uncertainty, but nevertheless the spirit of self-help and mutual help have been alive all the time and are now making themselves felt in the way of better business, which will be still better later on. The outcome of the election made some difference in our shipping department, for we held a number of orders dependant on the election of McKinley, and as we have known of similar instances, we can have no doubt as to McKinley's election being a benefit to the country aside from any political question.

" As for 1897, business prospects are good—at least good to all who are in any way hopeful or energetic. Even in 1896 we quite largely increased our business in those lines where we put in some extra hard and intelligent work.

" Probably business men are not exceptions to Mr. Atkinson's favorite quotation from Emerson: 'Man is as lazy as he dares to be,' and we shall therefore shake off any lethargy that may have settled on us, and start in on 1897 at a record pace, for collections are now very good, and everything so far as we can see is encouraging to all manufacturers for both home and export trade."

THE strike at the Chesapeake Nail Works, Harrisburg, Pa., has been adjusted between the nailers and helpers.

IMPROVED DUPLEX MILLING MACHINE.

The field of the milling machine in well-appointed machine shops has been growing steadily in recent years and its conveniences and economies for many kinds of service heretofore performed by the planer and shaper are being constantly

FIG. 1.—NO. 0 MACHINE.

demonstrated. The fact is becoming better appreciated, also, that for surfacing, an end or face mill, with spindle in vertical position, can be used to good advantage. For this and other forms of work the end mill is found by many to give better results than those cutting on the circumferential

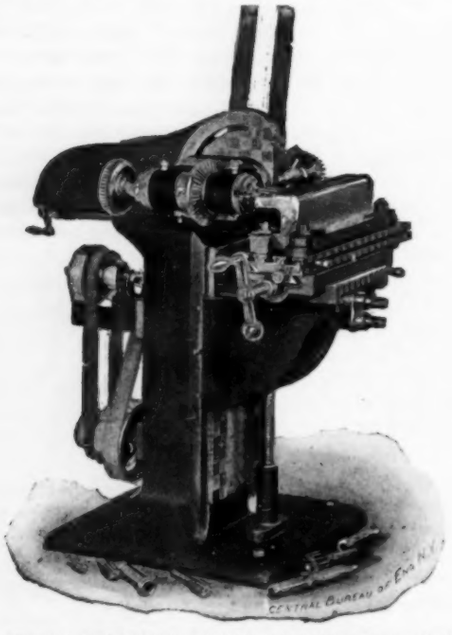


FIG. 2.—CUTTER SPINDLE IN HORIZONTAL POSITION, IN WHICH THE CONDITIONS FOR CUTTING ARE SIMILAR TO THE FIXED HORIZONTAL SPINDLE MACHINE.

edge. The horizontal spindle type of machine, in plain and universal, and the more recent vertical type have their respective advantages; and now a machine is offered that partakes of the good points of both. It is the Van Norman duplex milling machine, designed by Chas. E. Van Norman, president and manager of the Waltham Tool Co., of Springfield, Mass. It has also a range of movement and work that does not belong to either of the types referred to.

The Van Norman machine has a base and work-holding table with slides very similar to the ordinary forms. It also has a main head frame with a large range of movement at right angles to the longitudinal movement of the work-holding slide or table. Attached to the main head frame in a vertical plane and parallel with the main head frame is the spindle or cutter head, which has a pivotal connection with the frame, so it can be set in any position between the vertical and horizontal. The design and arrangement of the parts

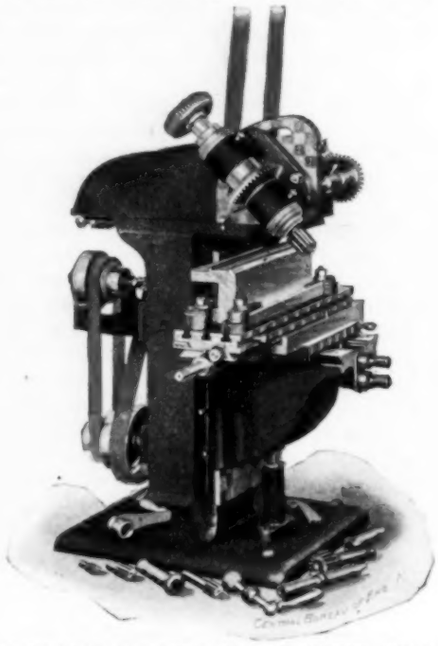


FIG. 3.—MAIN HEAD RUN FORWARD AND CUTTER SPINDLE SET AT 45 DEG.

is such that great rigidity is obtained in whatever position the frame andcutter head is placed.

A great variety of cuts may be made with this machine. Work may be clamped on the table or held in a vise, and with-

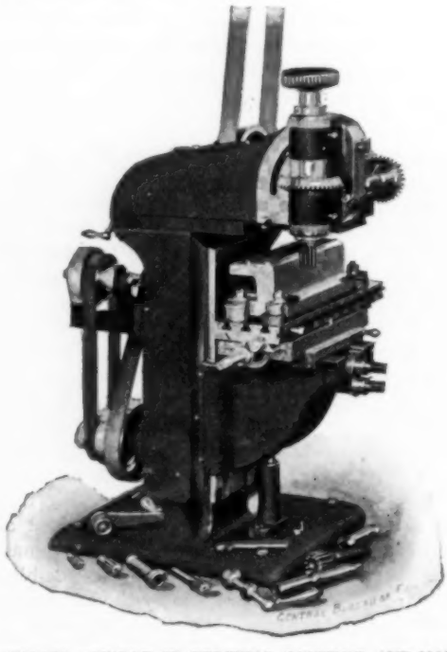


FIG. 4.—CUTTER SPINDLE IN VERTICAL POSITION, AND MAIN HEAD FRAME RUN OUT OVER COLUMN FULL DISTANCE.

out releasing the work the cutters may be brought to bear upon the work in any position between the vertical and horizontal. Bevel cuts can be taken with right-angled cutters. Holes may be drilled in true alignment in vertical and horizontal position. The tables are arranged to give automatic feed almost the entire length, so that work may be secured on the full length of the table and the cutters brought to bear

on it in either vertical, horizontal or angular position. The machine has a gear-driven mechanism, the cone being held in a stationary bracket with a splined shaft, attached to gear, passing through it, and moving with the main frame and head.

The accompanying illustrations indicate well the range of adjustments and adaptations of the machine. They show also the tools used in connection with it. A variety of attachments for spirals and other special cuts may be employed. In the No. 0 machine, the main head frame to which the swivel cutter head is attached, has a movement in and out over the column of 6½ inches. The swivel cutter head is so attached that all angle cuts can be made the full length of the movement of the table. The driving pulley has three steps and the double friction clutch pulleys give, when desired, six speeds. The speed of the countershaft is six revolutions. The table is 18 inches long, 4 inches wide and has automatic feed of 14 inches. The carriage moves in and out from the column 4½ inches, and the knee has a vertical movement of

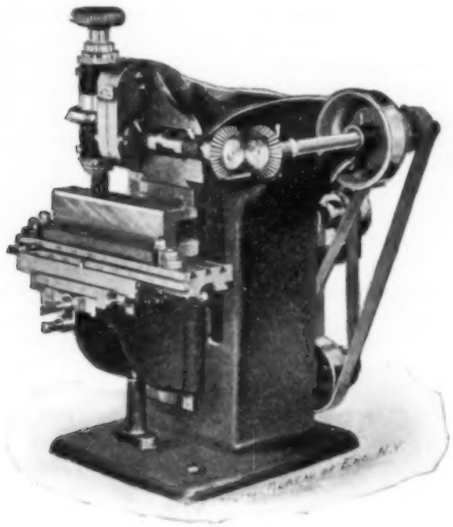


FIG. 5.—ARRANGEMENT OF DRIVING MECHANISM.

10½ inches. The floor space occupied is 19 x 21 inches and the height of the machine from the floor is 53 inches.

The manufacturers, the Waltham Watch Tool Co., will put a full line of these machines on the market as rapidly as possible.

Ore Nuggets from Edison's Concentrating Plant.

A daily newspaper dispatch of Dec. 24, referring to Edison's iron ore concentrating plant at Edison, N. J., which has been in operation lately concentrating a quantity of ore and putting it in the form of nuggets for experimental work at the Crane Iron Co.'s furnaces at Catasauqua, Pa., says that the plant is scattered over 11 acres and has cost about $2,000,000. Traveling cranes are employed to handle the great masses of ore-bearing rock as they are blasted from the mountain side. A five-ton boulder can be taken in by the crushing machinery. Over 700 immense magnets are employed in separating the magnetic ore from the gangue, and it is stated that 5,000 tons can be produced in a day, the finished product, as it is put into the cars ready for shipment costing 78 cents a ton. A less sanguine view of this enterprise was taken by S. B. Patterson, superintendent of the Andover Iron Co., Phillipsburg, N. J., in a paper he prepared for the 1895 Report of the Bureau of Statistics of Labor and Industries of New Jersey. He said that the great difficulty was the cost of crushing the lean material, containing only about 18 per cent of iron. Fine pulverization is only possible at great cost. The expense of quarrying a single ton of raw material is considerable and this must be counted several times in figuring on the cost of sufficient rock to produce a ton of concentrated ore. The objection urged by Mr. Patterson against the fineness of the ore, which he asserted would prevent its use in furnaces, except in small quantities, seems to have been met in the use of a binder and the preparation of the ore in the form of cakes. This, however, increases the cost considerably.

LOCOMOTIVE BUILDING IN 1896.

The locomotive output of the contracting shops in 1896 exceeded that of the previous year by 74 locomotives, but exceeded the number built in 1894 by 480 engines, or more than two-thirds of the total output of the earlier year, 695 engines. The actual number of engines built in 1896 was 1,175, and last year 1,101 engines. In spite of this increase the year just past was not a very fortunate one for locomotive builders, although they appear to have fared much better than the car builders, judging by the incomplete returns of car building now at hand. Six companies, out of the 12 reporting (all of the locomotive building concerns except the one which has, perhaps, the smallest output,) increased their output over the previous year, building 800 engines in 1896, against 597 in 1895. Considerably more than half of this increase is reported by one company, while another of the large companies doubled its output. Taking out the product of these two companies, it will be seen that the others shared very little in the increase, the output of each, as a matter of fact, being nearly the same as in 1895. But the other six companies from which we have reports did not do even so well as to maintain their 1895 record. Grouping the output of these companies, we find that they built 492 engines in 1895, and 117 less this year. The loss is well distributed, although one company built less than half the engines it turned out in the preceding year. An interesting feature of locomotive building in this country is the growing importance of export orders. Two years ago, the number built for export was only 80, while in the past year the number has increased to 309. Thus, while but 11 per cent of the total of 1894 was for foreign countries, more than 26 per cent of the engines built in 1896 were exported. Government figures for parts of years are at hand in the last report of the Bureau of Statistics. They show that in the 10 months to Oct. 31, 1896, 279 locomotives, valued at $2,635,000 (an average of nearly $10.000), left the ports of this country, as compared with 156 locomotives valued at slightly over one and a half million dollars exported in the same period in 1895. Several locomotive works are now engaged on export orders, of which that for 31 enines for Japan at the Rogers and Baldwin shops is most interesting. Locomotive building, though better in 1896 than in either of the two preceding years, is still far below the figures reached a few years ago, as will be seen by the following recapitulation of the number built in each of the last six years:

1896	1895	1894	1893	1892	1891
1,175	1,101	695	2,011	2,012	2,165

What the new year may bring it is useless to try to guess. None of the contracting shops has orders which cannot be disposed of in a short time, and so far there has been little evidence to show that the railroads are going to give out the orders that the locomotive builders would like to have, and are convinced are required by the railroads. The waiting policy is evidently still the controlling one, as for a long time past. With an assurance of a steadily increasing traffic, which has been so long coming, the hearts of the locomotive builders may yet be gladdened with welcome contracts.—[Railroad Gazette.

THE Chicago Title & Trust Co. was appointed, Dec. 28, trustee to take charge of and manage the John Featherstone's Sons Co. This was done by agreement between the attorneys representing the creditors, stockholders and otherr interested in the company. The trust company is to appoint a new board of directors for the corporation and is to be practically the manager of the concern until John, Arthur and George Featherstone, stockholders, return all moneys which they have withdrawn from the treasury of the company. Their stock in the corporation is then to be returned to them by the trustee.

J. P. JOHNSTON, for some years with the Babcock & Wilcox Co., in their main office and later salesman in their Pittsburg office will take charge of the Cleveland office for the Cahall Sales Department for the sale of Cahall vertical and Cahall-Babcock & Wilcox boilers, manufactured by the Aultman & Taylor Machinery Co., at Mansfield, O. The appointment takes effect Jan. 1, 1897.

PROPERTIES OF WROUGHT IRON AND STEEL.*

BY PROF. J. B. JOHNSON.

When the general adoption of the Bessemer process of making steel had led to its reduction in price, so as to become a competitor of wrought iron, and when it was shown that the usual mechanical tests revealed an equally soft and much tougher material, steel began to replace wrought iron in a thousand ways. And as it had never been found necessary to apply scientific tests to, or to make chemical analyses of, wrought iron, so it was supposed the steel could be purchased in the open market with equal security. An untold number of astonishing and unexplained failures of Bessemer steel in rails, boilers, axles, shafts, etc., has now thrown suspicion on all kinds of steel when used under the most trying conditions, and the object of this paper is to restore confidence in this material by explaining some of the causes of its failure, and by showing how to avoid them. It is now commonly regarded as more or less treacherous, but I shall hope to show that when purchased under the ordinary conditions as to inspection now prevalent in this country, and under reasonable specifications, neither of which limitations will appreciably increase the cost, a far more efficient and reliable material may be obtained, and at less cost than would result from the continued use of wrought iron.

The conclusions offered in this paper will be based on actual tests, the geographical representation of many of which will be shown on the screen. But before beginning with these I wish to give my views concerning the endless controversy about the cold crystallization of iron and steel, in service, from shock, vibration, or what not.

Concerning steel little need be said in this connection besides the general fact that all steel, whether simply cast or cast and rolled while hot, is always and under all circumstances wholly crystalline. It always crystallizes in the process of cooling, and it cannot be obtained cold in any other form. When pulled apart in a testing machine, or bent cold in the full section and broken, it shows a fine, silky fracture, which leads to the impression that the structure is fibrous. This appearance is produced by the cold drawing out, and is not the normal molecular arrangement. When nicked or grooved by a V-shaped tool, and broken across, it always reveals a crystalline fracture.

Concerning wrought iron, however, the case is different. Its production from a puddle-ball is like the formation of butter in the bath of buttermilk, or like a sponge dipped in molasses, and when it is squeezed and rolled the adhering slag forms into separating sheaths about the nearly pure iron filaments, thus giving to the structure an essentially fibrous character. Each filament of pure iron is a series of very small and distorted crystals, but these are not visible to the naked eye. It is common, however, in the cheaper grades of wrought iron, to find on a broken cross-section large crystalline areas, and sometimes nearly the entire section presents this appearance.

There are three general causes of this crystalline structure: First, the so-called wrought iron may have been rolled from faggoted scrap, some of which was probably high-carbon steel, and this portion would show a crystalline fracture. Second, the puddle-ball may have been formed under too great a heat (a common fault), so that a portion of it had been actually melted, thus forming of this portion ingot metal or steel, which part would, when cold, be wholly crystalline. Third, the puddling process may have been incomplete, when, with a low fire, some of the unreduced pig iron would be removed with the ball, and this would form a coarsely crystalline portion of the final rolled bar.

Concerning the cold crystallization of wrought iron, however, my views are as follows:

I. The normal molecular arrangement of wrought iron is crystalline, but the thorough admixture of the inert slag in a well-worked product prevents these crystals from forming in visible sizes. The ordinary fracture, therefore, exhibits rather a lateral view of these finely crystallized threads, thus causing this to present a fibrous appearance.

II. From one or more of the three causes named above a large part of any so-called wrought iron bar may be actually and coarsely crystalline from the time of its first cooling.

III. With the ordinary and more inferior grades of wrought iron now on the American market, it is very common to find very large portions of the cross-sections of test bars showing a crystalline fracture, even for tension test specimens of standard form. Much more, therefore, are such irons likely to have this appearance when nicked and broken across, or when nicked and pulled in tension.

IV. All wrought iron, when broken with extreme suddenness, will show a crystalline fracture. This is because time is not given for the drawing out of the section, rupture occurring directly across the fibers, so that the fracture shows only the end view of the same.

V. When a bar is nicked with a sharp chisel, or grooved in a lathe with a sharp-pointed tool, and broken across, rupture begins at one side, without any elongation of the fibers, and extends from fiber to fiber across the section in such a way as to produce a result similar to that caused by an instantaneous rupture. In this way wrought iron will often show a crystalline or granular fracture, when, under the ordinary tensile tests, it would be wholly fibrous. All steel or ingot metal will always show a crystalline fracture when treated in this manner, although for the soft and medium grades of steel the fracture is always fibrous or silky when broken in tension, with the usual accompanying elongation and contraction.

VI. Much of the so-called wrought iron on the market today consists simply of rolled faggots of "scrap iron," a large portion of which is scrap steel. As these are heated only to a welding heat and then rolled into merchant bar there is no real mixing of the several metals, and the several components form so many separate portions of the cross section of the final rolled forms. The crystallized steely areas found in the fractures of most ordinary wrought irons today can be largely traced to this source. Wrought iron railway axles and other large forms are usually made up in this way.

VII. When wrought iron breaks in service, therefore, and shows a coarsely crystalline fracture it does not prove to my mind that crystallization has occurred in service. It proves only that this iron had such a structure originally. If, however, the rupture occurs in practice in a suddenly contracted area, as in a screw-thread, or in a sharp angle, or if it has been produced with extreme suddenness, as in case of an explosion or shock of any kind, if the appearance of the fracture is finely crystalline or granular, this appearance may be wholly due to the method of failure. This is shown by the fact that if a specimen be cut from the adjoining metal and tested in tension with the standard form of specimen it may show a wholly fibrous fracture. In such case, therefore, the crystalline appearance of the fracture is due to the particular conditions as to shape of specimen and suddenness of rupture and not to any molecular change which has taken place in the iron.

VIII. The following is taken from the Annual Report of Tests of Metals, made at the United States Arsenal, at Watertown, Mass., for 1890, in which are recorded in many tests of specimens cut from the journals of old railway axles: "Wrought iron axles have been examined which have had long continued service, the journals of which showed incipient cracks, indicating that rupture had begun, and that further use must result in complete rupture. It is a remarkable fact that the tests of the metal of these journals near their cracks showed no loss of strength or ductility. No indications of a tendancy to crystallize were discovered, and inasmuch as the metal had gone through all the phases of deterioration up to the limit of actual rupture without showing a crystalline tendency, it is thought this demonstrates and proves that this material is incapable of cold crystallization when exposed to the conditions of service."

In one instance one of the old cracks, which had developed at the inner shoulder of the journal, reached to a depth of 0.02 in. into the side of the test specimen, and yet the specimen broke two inches from this section. After rupture the ends of the specimen (one and one-eighth in. diam.), containing this crack was bent cold 33 degrees with "this crack at the middle of the bend on the tension side, which opened the crack in width, and also developed numerous other cracks in

* Extract from a paper on the "Mechanical Properties of Wrought Iron and Steel, as Shown by Actual Tests," read at the November meeting of the St. Louis Railway Club.

the vicinity," but without rupture. All the tests showed fibrous fractures.

[Prof. Johnson referred in the paper to experiments he had conducted at the University of Missouri and presented lantern-slide views of fractures of steel and iron. Two views showed broken wrought iron railroad axles. These were broken by bending back and forth under impact, one of them at a temperature of 300 degrees Fahr., the other at 18 degrees below zero. The latter broke under a less number of blows than the hot axle and it showed what would commonly be called a crystalline fracture, while the fracture of the specimen broken hot was fibrous. The cold break is really as fibrous as the other specimen, but it breaks sharply across, the fibres giving it the crystalline appearance.

Another view showed test specimens cut from a 16-inch shaft, forged for a United States cruiser which failed soon after being put into service. This showed the bad effects of trying to forge large axles under light hammers. The test specimens all showed an ultimate strength of about 70,000 lbs., per square inch but those toward the circumference of the shaft had an elongation of 21 per cent, a group further in seven per cent, another group still further in five per cent, and those nearest the center showed but two per cent elongation. Four specimens were cut from the other side of the shaft and forged down to the same size as the test specimens and when these were tested they all showed about the same elongation, namely 25 per cent, and about the same ultimate strength, which was now raised to 75,000 lbs., showing the result of forging, the whole set being the great argument in favor of hollow-forged shafting.

Prof. Johnson's general conclusions were as follows: "As between steel and wrought iron for car and locomotive construction, I should say, always use steel where the material is not to be forged or welded. While no better structural material is made than the best grades of wrought iron, yet these are so expensive as to preclude their use for most purposes. As between the cheap wrought iron in the market today and mild steel of about the same price, the steel is so far superior as to stop all competition when the facts are known. It is important, however, to purchase all such material under carefully and intelligently drawn specifications, and to follow these with competent inspection to get the worth of the money expended for this raw material."]

FIRES.—Machine shop of Geo. Rolling & Co., 34th st. and Valley railroad, Pittsburg; loss $4,000. At New York, repair shops of the Bushwick division of the Brooklyn Heights Railway Co.

BOILER-MAKERS' POWER PUNCHES.

The illustrations are of two types of punches manufactured by Bertsch & Co., of Cambridge City, Ind., Fig. 1 showing a back-geared punch and Fig. 2 a plain punch with a heavy fly-wheel for belt, similar to the arrangement for belting presses. The back-geared punch is made with 12-, 16-, 18-, 21-or 24-inch throat, and is especially adapted to a general line of light and heavy work and punching flanges and angle iron. All the shafts and wearing parts are steel, and the bearings are long and wide, especially that of the punch plunger, which is also adjustable so that any slight wear can easily be taken up. The plunger is operated by a brass box. The punch is provided with steel die plate, and patented clutch with automatic up-stop, leaving the punch at its highest point. If the treadle be kept down the punch runs continuously. The clutch jaws have steel plates, making them durable. The manufacturers furnish an adjustable back gauge, and a special adjustable side-pin gauge for punching holes equidistant without marking off.

The plain power punch shown in Fig. 2 is made with 12-, 16- or 21-inch throat. For heavy work the back gear is attached as in the punch shown in Fig. 1; in other respects the design is the same. This punch is also made with deeper or shallower throat for lighter or heavier work. A lever socket for operating by hand is also provided. The weights of these punches range from 950 lbs. for the 12-inch to 1,950 lbs. for the 21-inch.

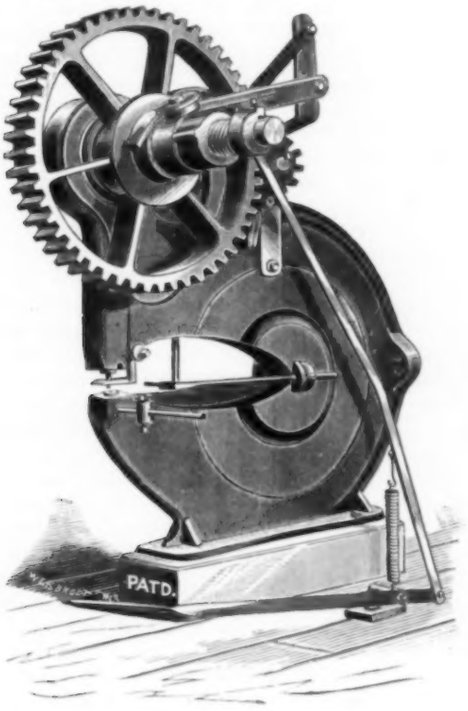


FIG. 1.—BACK-GEARED PUNCH.

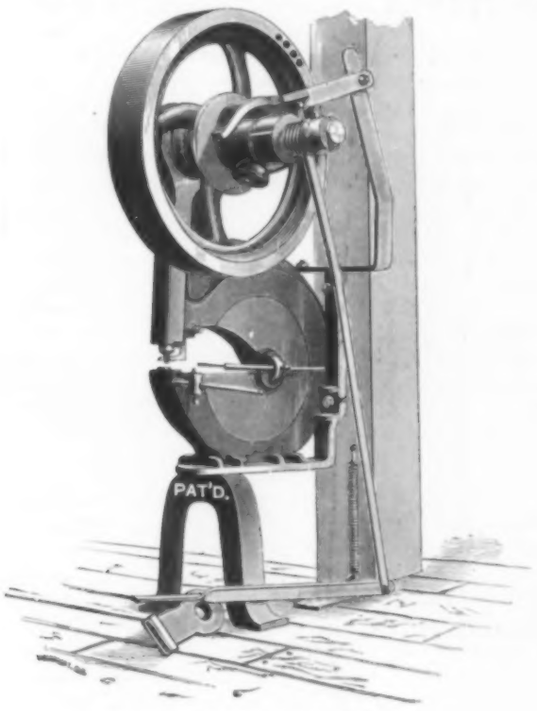


FIG. 2.—PLAIN POWER PUNCH.

FRANCIS W. HOLBROOK, president and treasurer of the Union Drop Forge Co., of Chicago, died very suddenly of apoplexy, on La Salle street, Chicago, Wednesday, Dec. 23. Mr. Holbrook was widely known in the business world. Ten years ago he went to Chicago from the East as the Chicago manager of the house of A. T. Stewart, of New York. He soon became identified with the Union Drop Forge Co. He was about sixty years old and had an enviable reputation for business shrewdness and as an expert accountant. He leaves a widow, two sons and seven daughters.

THE weekly output of Connellsville coke is getting close to the 100,000 ton mark, having been not far from 50,000 tons at the lowest point, this year. In the week ending Dec. 19 the total was 97,254 tons. No announcement is made yet of a reduction in the circular price of coke, though the $2 basis is not maintained on furnace coke.

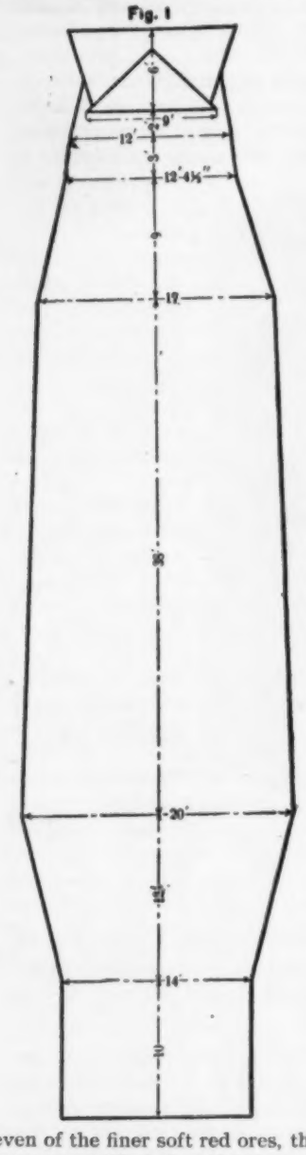
DAVID THOMAS, formerly an iron inspector, died, Dec. 27, at his home in Harrisburg, Pa.

CARBON DEPOSIT AND FURNACE MIXTURES.

In *The Iron Trade Review* of Oct. 8, appeared a synopsis of a paper read by Mr. O. O. Laudig, chemist of the Buffalo Furnace Co., N. Y., read at the Denver meeting of the American Institute of Mining Engineers. The subject was "Action of Furnace Gases on Iron Ores," and a series of experiments was detailed, in which blast furnace gases were passed over various ores, and the carbon deposition and the increase in bulk of the ores were noted. A contribution to the discussion made by Mr. F. E. Bachman, manager of the Buffalo Furnace Co., has just appeared. From the concluding portion of it, in which Mr. Bachman makes a suggestion as to furnace lines best adapted to practice employing Mesabi ores we take the following:

The average amount of carbon deposited by the soft red hematites from the old ranges is 13.82 per cent of the original weight of the ore, the extremes being 35.13 and 4.48 per cent; hard hematites average 7.52 (extremes 12.88 and 2.16); blue ores average 3.08 (extremes, 4.72 and 1.56); brown ores average 12.94 (extremes, 24.92 and 0.98) per cent. Magnetites give practically no deposit; Mesabis average 21.61 (extremes, 36.40 and 10.20); cinders and scales average 0.38 (extremes, 0.74 and 0.08) per cent. This shows that the Mesabis deposit almost twice as much carbon as any other class of ores treated. If the samples treated represent the average of this class of ores, this fact must have a bearing upon their use; and I think it explains the cause of some of the trouble their use has occasioned. The ores of this class were of double their original bulk after burning off the carbon, the carbon and ore together making four or five times the bulk of the original sample. As we found the gas pressure to increase from 2.35 ounces to ten ounces in descending the furnace ten feet, we can readily see the effect of using an ore as fine as No. 1, 2, 3, or 15 [the finest ores used in the experiments.—Ed]. We have approximately, in this case, two volumes of coke and stone to one volume of ore. If the ore-charge is lumpy, or even of the finer soft red ores, the charge will be, to a certain extent, stratified; but if it is very fine and sandy, the ore will fill all the openings between the lumps of coke and stone. The ore then deposits carbon, and is expanded to four or five times its original volume, giving in the charge one volume of coke and stone to two and one-half volumes of ore and carbon; or, in other words, the volume of the charge is increased from one and one-half times the volume of the coke and stone to three and one-half times their volume in a descent of ten feet, while the area of the furnace is not increased in proportion. The effect of the packing is that the gas channels passages through the stock, the breaking through of these channels or chimneys being indicated by puffs of black smoke with an excess of gas for a few seconds, a shower of flue-dirt and a relief of the pressure in the upper parts of the furnace.

Fig. 1



That these puffs are not necessarily slips, is easily shown by gauging the furnace. At times, all the gas passes through these chimneys, the charges decending until they reach a temperature where reduction takes place by the direct union of solid carbon with the oxigen of the ore, causing a sudden and unaccountable cooling of the furnace. Again, the stock packs so tightly that the gas cannot form a channel, in which case it takes but a few seconds to raise the pressure in the whole furnace to such an extent that when it becomes sufficient to force a passage, the down-comer is not large enough to accommodate the excessive amount of gas, and the bell and hopper are laid on the platform or thrown over the side of the furnace in the too familiar top-explosion, so common when Mesabi ores were first introduced.

If this theory is correct (and there are a great many facts to confirm it, such as the lack of top-explosions in furnaces using larger amounts of cinder with Mesabi ores, and the fact that ores which are rather lumpy and deposit small amounts of carbon and reduce readily, have been found to work admirably with Mesabi ores), what is a desirable ore-mixture?

First, one which has a sufficient amount of slag-making material to give a regular furnace working, and take up the sulphur in the charge without giving over two per cent of sulphur in the cinder.

Secondly, one in which all the ores lose their oxygen rapidly and uniformly at the lowest possible temperature; for if one loses its oxygen slowly, either an excess of fuel will be required, or the furnace must be driven slower to accommodate that ore. In other words, a mixture in which each ore loses 25 per cent of its oxygen in a given time can be driven faster than if one ore loses 49 per cent of its oxygen in the same time, and the other loses one per cent.

Thirdly, one in which there is a sufficient carbon-deposit by each ore to (1) thoroughly disintegrate it, (2) convert all the CO_2 of the flux to CO, and (3) remove all the oxygen from the ore that is not removed by combination with CO, and as much more as possible without causing top-explosions and irregular working.

Where it becomes necessary to use ores depositing too much carbon, the troubles from their use can probably be prevented by mixing these with ores depositing small amounts of carbon, especially if they are lumpy. What amount of carbon-deposit may be allowed with safety will depend to some extent on the fineness of the ore originally, as lumpy ores will not fill the crevices between the coke and stone as readily as fine ores. If, after further experience and research, these theories for the causes of the difficulties in working Mesabi ores prove to be correct, a change from the ordinary furnace lines may possibly prevent the trouble arising from their use, and a furnace constructed to prevent packing of the stock below the stock-line is the natural solution. For a 20x80 foot furnace I would suggest, as worthy of a trial, the lines shown in Fig. 1.

Echoes of the Wire Nail Pool.

It is reported that the nail-making equipment of the Ohio Wire Nail Co., whose works are at Rockport, near Cleveland, has been purchased on behalf of a number of capitalists who anticipate the rehabilitation of the wire nail pool. Nail-making machinery from other plants is also being bought up. The Ohio Wire Nail Co. was started several months ago and operated independently of the pool.

A peculiar suit has been filed in Cleveland growing out of the nail pool regime. Wm. E. Saunders & Co. file a petition saying that in September they placed an order with the Ajax Mfg. Co., Cleveland, for nail machines. The latter company, in soliciting the order had urged that it be placed at once, representing that the machines would pay for themselves every 14 or 15 days, and that the pool would not meet until December to change prices. The order was given, but the machines were never delivered, and suit is now brought for $9,480.04, being the money which plaintiffs say they would have made had they received the machines. They aver that the Ajax Mfg. Co. informed them that they could buy wire at $1.25 per 100 lbs. and kegs at 10 or 11 cents each. Relying on these representations, plaintiffs entered into a contract with a responsible firm to buy all the nails they produced at 30 cents below the market. They also bought 200 tons of nail wire, and spent $429.38 in changing machinery in their factory. Under the conditions then existing plaintiffs say their daily cost of product would have been $375.56 and their daily profit $380.69.

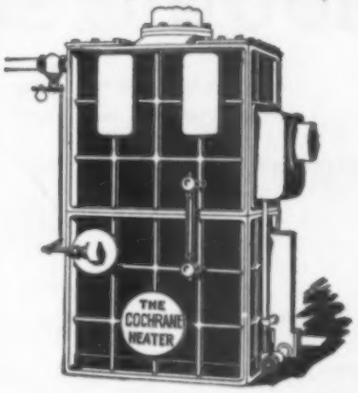
OPEN HEATERS FOR BLAST FURNACES.

"We do not believe in them for plants of this kind," was the remark made to us recently by a prominent engineer whose specialty is the design and construction of blast furnaces.

"Why not?" said we. In reply, he stated that such plants were run continuously night and day, without any stops for examination and repairs, and that therefore closed or pressure Heaters were preferred for this particular service.

Was it not curious that at that precise moment we were shipping two of our large COCHRANE HEATERS to replace some six Heaters of the pressure type, that had given out after a few years' use? These closed heaters had rusted out after continually leaking, and the owners—blast furnace people—thought it advisable to get something better adapted for their purposes.

Hot water—real purification—reliability—ease of operation and cleaning—simplicity and adaptability for the purpose of the material used, insuring freedom from repairs and longevity—these are the advantages which are doubling every year our sales of the COCHRANE HEATERS.



HARRISON SAFETY BOILER WORKS,
PHILADELPHIA, PA.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

An independent factory for the manufacture of nuts and bolts is to be established at Anderson, Ind., by a company of which L. S. Taylor is to be manager. It will use buildings already erected, and the machinery is to be installed by Feb. 1.

The machine department of the Springfield Foundry Co., of Springfield, Mass., and the Valley Pump Co., of Easthampton, Mass., have consolidated, forming a new corporation, the Springfield Elevator & Pump Co., which will manufacture hydraulic, electric and power elevators and the full line of steam and power pumping machinery formerly built by the Valley Pump Co., at Easthampton, Mass.

The United States Seamless Tube Co., recently incorporated in New Jersey, by W. J. Curtis, of New Jersey, E. C. Converse, of New York; Joseph Claudett, of New York; Horace Crosby of Pittsburg, and Charles M. Wood, of Brooklyn, to manufacture bicycle tubing and horseless carriages, is reported to have fixed on a location for the works at Christy Park, near McKeesport, Pa. The work of construction will begin, it is reported, within 90 days. The concern is affiliated with the National Tube Works Co. It will employ between 300 and 400 men.

"Machinery," who may be addressed in care of the *Current* office, Norway, Mich., wants to buy second-hand air compressors in good condition.

D. H. Ledbetter, Cordele, Ga., will want press for sheet metal for stamp work, a drill press, automatic engine lathe, upright engine with boiler, or possibly gasoline engine.

W. W. Wagner, Brownsville, Tenn., is in the market for a cheap air compressor in good condition.

New Construction:—

The Federal Hill Foundry Co., of Baltimore, Patrick Kennedy, proprietor, will erect a new plant.

The Rhode Island Tool Co., Providence, R. I., has commenced the erection of a one-story brick and iron factory building, 24x40 feet, with pitch iron roof.

The Wm. Bell Co., steel manufacturer, New York City, is negotiating for the erection of a plant at Corning, N. Y.

Clough & Anderson, of Jamestown, N. D., will erect a new machine shop in the spring to cost about $10,000.

Robert Wetherill & Co., Chester, Pa., have plans made for the erection of a new and modern foundry.

The counties of Ocean and Monmouth, N. J., have just awarded the contract for a bridge, between Point Pleasant and Manasquan, to the Berlin Iron Bridge Co., of East Berlin, Conn. This bridge will be one of the longest highway bridges in the United States and is to be 1,910 feet in length. The Secretary of War has ordered a draw span constructed in this bridge, which will give two clear openings, one of 45 feet and the other of 60 feet. The Berlin Iron Bridge Co.'s contract includes the substructure as well as the superstructure for the bridge.

Harry Guenther & Bro., of Owensboro, Ky., will establish a branch foundry and machine shop at San Antonio, Tex.

Surveys have been made, plans drawn and preliminary work perfected for the construction of a power plant capable of developing from 100,000 to 200,000 h. p., near Massena, St. Lawrence county, N. Y., by the St. Lawrence Power Co., incorporated on May 9, 1896. It is stated that those interested have acquired in all 1,800 acres of land for the proposed construction and that the necessary capital has been secured.

The Pennsylvania Co. will build a new steel bridge across the Susquehanna river at Columbia, early in 1897.

The officers of Allegheny City, have substantially reached an agreement with the Pittsburg, Ft. Wayne & Chicago Railroad to raise its tracks for a considerable distance through the city, abolishing grade crossings at all the streets except Federal st. The proposed work will cost $1,500,000 or more.

Additions, Enlargements, Removals, Etc.:—

Chattanooga Roofing Works—The Chattanooga Steel Roofing Co. will build an addition to its works to cost $3,000 to $4,000.

The Lukens Iron & Steel Co., Coatesville, Pa., manufacturer of iron and stell plates, has enlarged its plant in the past year, and now has an annual capacity of over 60,000 tons of steel plates.

General Industrial Notes:—

The tin plate works of the Laughlin Nail Co., Wheeling, W. Va., have been running steadily throughout the entire year, not having lost a day either from breakages or lack of orders. The output of tin plates will be about 100,000 boxes for the last six months of the year.

The report that William Clark's Sons & Co., operating the Solar Steel Works, at Pittsburg, would start up their two open-hearth furnaces is untrue.

The Wheatland Iron Works, owned by the estate of Jos. and Hannah Wood, deceased, and of which the Safe Deposit & Trust Co., of Pittsburg, are trustees and treasurer, are to be purchased by T. S. B. Wood, of Pittsburg. The plant has been idle for a number of years, and the property is now in the hands of the Orphan's Court. All the interested heirs have filed a petition asking that Mr. Wood be allowed to open the mill, and later on, if he desires, to purchase the property. The plant was built in 1872, and contains 13 double puddling furnaces, 12 heating furnaces, and three trains of 24-inch rolls. The annual capacity is estimated at 27,000 gross tons of plate iron.

The Keystone Axle Co., whose plant has been under erection at Beaver Falls, Pa., for some time, will be in operation by Feb. 1, 1897., making car axles by a new process. The machine is the invention of J. T. Rowley, for many years a roller

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ‡ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.: No. 222 So. Third St., Philadelphia, Pa.; Ferguson Block, Pittsburgh, Pa., Stowe, Fuller & Co., 195 Merwin St., Cleveland, Ohio.

DUCTILE CAST IRON

TENSILE STRENGTH 60,000 LBS.

HOMOGENEOUS, SOLID AND CLEAN.

HIGH ELECTRICAL PERMEABILITY.

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CONSULTING AND CONTRACTING ENGINEER.

Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Billet Heating Furnaces. Plans and estimates furnished.

CONESTOGA BLDG., PITTSBURG PA.

Stowe Fuller & Co.

WESTERN AGENTS OF

Mount Savage and Queen's Run Fire Brick

The leading BRICK of this country.

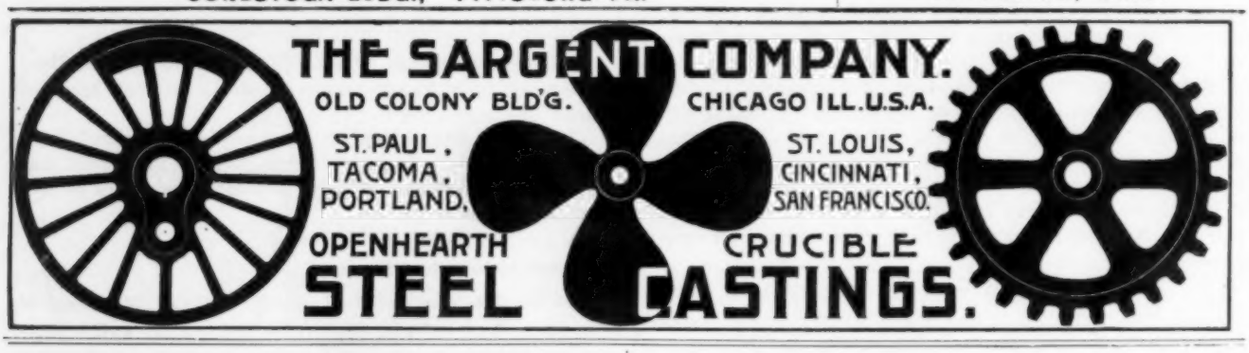
MANUFACTURERS OF

OHIO FIRE BRICK. ALL SHAPES IN STOCK.

The largest shippers of FIRE BRICK in the West.

Warehouse and Docks: 185-193 Merwin Street,

CLEVELAND, OHIO.



at the plant of the Cambria Iron Co., Johnstown, Pa. It is claimed that with the use of this machine, 300 well finished and complete axles can be turned out in 10 hours.

The Harriman Rolling Mills, at Harriman, Tenn., have been sold at auction to W. B. Crinkley, of Warrington, N. C., for $18,010. The sale is subject to confirmation.

It is reported that the blast furnace of the Warwick Iron Co., of Pottstown, Pa., which has been idle since September, has been blown in. Improvements have been made while the furnace has been closed, and the capacity increased from 1,100 to 1,200 tons per week.

The reason for this increase in speed is on account of no variation in steam in cleaning fires. The application of the forced draft outfit to the boiler plant has also had the result of obtaining greater steaming capacity of the boilers. I can heartily recommend this system of mechanical draft for lake boats to any one."

Capt. John Green, of the steamer Lewiston, Buffalo, sends the following unsolicited letter to the Buffalo Forge Co., Buffalo: "In acceptance of your forced draft plant in the above boat I take great pleasure in stating that the outfit is more than satisfactory. The results have more than surpassed our most sanguine expectations. The saving in fuel per trip from Chicago to Buffalo and return from 15 to 20 tons of coal, which very soon repaid the cost of the plant. In addition to this the speed of the boat has been increased one-quarter to half a mile per hour over the best previous time."

The new power company at Niagara Falls has now in successful operation its new power plant, consisting of four of the Leffel celebrated Niagara type of turbines, each of about 2,200 h. p. capacity, or giving in all some 9,000 h. p. These turbines drive eight generators of something over 1,000 h. p. each; two generators being connected directly to the shaft of each wheel, one being placed on each side. This comprises the most complete and perfect electric water power plant in the world. The same company has four other of the Leffel Niagara turbines, using in all eight of that style.

The Goodsell Packing Co., 15 West Lake st., Chicago, is offering to the trade hydraulic or pump packings for plungers, which correspond in quality with its other specialties—sleeve, dollar and rubber-back flax. The company's special hydraulic packings are made in plain, square and rubber-back square

U. BAIRD MACHINERY CO.

PITTSBURG, PA.

Have a Special Lot of Second-Hand Tools. All in First-Class Condition.

1—55″ Allen Riveter.
1—24x24x7 ft. New Haven Planer.
1—30x30x8 ft. Harrington Planer.
1—36x36x18 ft. Sellers Planer.
1—36x36x20 ft. N. Y. Steam Engine Co. Planer.
1—16x18″ Lathe & Morse Crank Planer.
2—15″ Hendey Shapers.
1—15″ Youngson Shaper.
1—15″ Smith and Mills Shaper.
1—10″x5′ Prentice Engine Lathe.
1 each 14″ and 15″x6′ Ames Engine Lathe.
1—16x5 ft. Bullard Engine Lathe.
1—18x8 ft. L. W. Pond Engine Lathe.
1—24x8 ft. Phillips Engine Lathe.
1—24x14 ft. Lathe & Morse Engine Lathe.
1—38x14 ft. New Haven Engine Lathe.

AND MANY OTHERS.

We have all the best makes of New Tools. Send for Second-Hand List.

ATWOOD & M'CAFFREY,

Brass Founders, Iron Pipe Fitters and Machinists,

MANUFACTURERS OF AND DEALERS IN

All Kinds of Pipe, Globe and Gate Valves, Fittings and Appliances for Steam, Gas, Water and Hydraulic Work.

Phosphor Bronze ("Elephant Brand") Castings, Coolers, Tuyeres and Cinder Notches for Blast Furnaces supplied promptly.

Rolling Mills, Steel Works, Blast Furnaces Coal and Coke Works, Power Houses for Electric Street Railways, etc., promptly fitted up by Experienced Workmen.

AIKEN Duplex and CRITCHLOW Valves, either three or four way, for operating Mill and Hydraulic Machinery of all kinds under any desired pressure, and Stop Valves for same.

Agents for the CAMERON STEAM PUMP, which is made in every possible variety, and suitable for all purposes to which Steam Pumps can be applied.

Nos. 108 to 118 Third Avenue, PITTSBURGH, PA.

styles, and are composed of the finest Sea Island duck fiber, frictioned together with pure para rubber. The company claims to be sole manufacturers of packings made in this manner. They can be compressed to one half size in a vise, but return to their original size when released. It is further stated that they will stand hot water.

An improvement has been made at the Rosena Furnace, at New Castle, in the method of shutting off the iron, after a cast has been made. This work was formerly performed by hand and required 15 minutes or more to accomplish. A machine called a "gun" has been installed to do the work, and the flow of iron is now stopped in four seconds. The gun is a steel cylinder about 10 feet long and six inches in diameter, and a jet of steam blows sand into the opening of the stack with such pressure as to almost immediately close up the aperture.

The Robinson-Rea Mfg. Co., of Pittsburg, is making two tin mills for the Beaver Tin Plate Co., Lisbon, O., which will make it a six-mill plant.

The Edgar Thomson Steel Works expect the blast furnaces, at Braddock shut down Wednesday, for the annual stock taking and repairs. When the plant resumes Jan. 4 it will be on rails instead of billets, which has been the product for some weeks.

The Illinois Steel Co.'s plant at Bay View, Wis., is shut down with the exception of the 8-inch and 12-inch mills. There is no immediate prospect of the mills resuming work for some little time.

The Pennsylvania Steel Co. has a large force of men at work on the repairs to No. 2 blast furnace at Steelton, Pa., and it is hoped to get it into condition for starting in January. There is now only one furnace in blast.

An independent factory for the manufacture of nuts and bolts is to be established at Anderson, Ind., by a company of which L. S. Taylor is to be manager. The company will use buildings already erected, and it is expected that the machinery will be installed by Feb. 1.

The Sterling Emery Wheel Mfg. Co., Tiffin, O., in spite of dull times has been operating its entire plant, and has made several improvements in the manufacture of emery wheels. Additional facilities and appliances give about two-thirds more capacity without any increase in buildings. Orders have been quite satisfactory.

The strike at the Morton Tin Plate Co.'s plant, Cambridge, O., is ended, the men having returned to work without the reinstatement of the foreman whose removal caused the trouble. The Amalgamated Association will provide him a position elsewhere.

The statement of the Tennessee Coal, Iron & Railroad Co. for November shows net business of $44,908 and fixed charges of $47,884, against $122,334 net business and $48,735 charges in November, 1895. For the 11 months ending with November the net business was $667,682 and charges $526,719, making the surplus $140,963, as against $395,671 in the same period in 1895.

The Sharon, (Pa.), Iron Works, have started off with a good lot of orders. Every department is on full time, 38 furnaces being in operation. One of the blast furnaces, idle over a year, has been lighted up.

The Atlantic Iron Co.'s Rolling Mill, at New Castle, Pa., is closed down, and may remain so for some time yet.

At New Castle, Pa., the Arethusa Iron Works, manufacturing sheet iron, will shortly resume operations.

The Columbus Iron Works of the P. Hayden Saddlery Hardware Co, Columbus, have closed down after a brief run on iron, with no immediate prospect of resumption. The mill had been idle for a year and owing to the price of steel billets had little prospect of starting again as iron orders are not sufficient to maintain operations.

A number of men employed in the converting mill of the Carnegie Steel Co., at Duquesne, have been dismissed because of the introduction by the company of the direct process, molten metal being taken from the furnace to the mixer and thence to the converter.

James L. Haven & Co., Cincinnati, foundry and machine shop, have assigned.

The Woodstock Iron Co., Anniston, Ala., will put its No. 3 coke furnace in blast.

The Chesapeake & Ohio contract for six locomotives has been let to the Richmond Locomotive Works. It was contin-

gent on McKinley's election. The Missouri Car & Foundry Co., gets a contract for 1,000 cars for the Fairport Dock & Warehouse Co., operating over the B. & O. The Armour Packing Co. and the Cold Blast Transportation Co. are contracting for 100 cars each.

There is some talk of Eastern capitalists rebuilding the Graff-Bennett mill at Millvale, Pa., and putting in new equipment. The property is controlled by stockholders in the Clinton Iron & Steel Co., and the work of dismantling has been in progress for some time. The plans for the future are not matured.

No. 1 blooming mill of the Pennsylvania Steel Co. has been idle for ten days and will probably not be started up until after the first of the year.

The Enterprise Boiler Co., Youngstown, O., has the contract for the erection of ten stacks for the new basic open-hearth steel plant at Sharon, Pa. They will be 110 feet high and five feet in diameter.

Langston & Wood, of Atlanta, have leased the Rome, Ga., cotton-tie mill and will put the plant in operation at once.

It is reported the Pennsylvania Steel Co., Steelton, Pa., has received an order for 6,000 tons of steel rails, 110 lbs. to the yard, for a line in New York City.

Mr. Thos. D, West has consented to prepare a paper on "Center Blast for Cupolas," for the spring meeting of the Iron and Steel Institute.

The slowness of British iron masters to introduce by-product recovery in connection with their coke-making, has been often commented on. It appears from the following that pig-iron making firms on Tees-side are at last taking steps to experiment, at least. An exchange says: "There has been a considerable reluctance on the part of the principal firms to introduce the German methods, which are understood to have yielded great economy, on the ground that it interferes with the quality of the coke produced. A fresh departure is, however, likely to take place soon, as some gentlemen of great experience are at present examining the German methods, and they will soon have a report to present which, although intended for an individual firm, will no doubt become an open secret. Meanwhile Sir B. Samuelson & Co. have, as is usual with that firm, been the pioneers of a new departure in carrying the coal to the blast furnaces, to be coked on the spot by the Simon-Carves system, and as that system has now been well tried over nearly 20 years the results can hardly be doubtful."

The North American Metaline Co., whose main office and factory are corner of West ave. and 3d st., Long Island City, N. Y., one block from the ferries from foot of East 34th st., and James slip, New York City, have recently issued a circular to the trade, with wholesale price list. The company notes its intention to protect its goods against parties who sell cheap imitations, representing them to be metalined bushings. The North American Metaline Co. is the successor of the company which first placed oilless bushings on the market and is the exclusive manufacturer of this product.

Winter Resort Excursions.

California and the West, Florida and the South.—Ask passenger and ticket agents of the Pennsylvania lines about the low rate, first-class service and quick time over this reliable route. Full information free. It will pay to investigate if you contemplate a trip. If not convenient to communicate with local representatives of the Pennsylvania lines near your home, address F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburgh, Pa., for desired information on the subject.

Home Seekers' Excursions West and South.

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Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

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3. Contain JENKINS DISC, which is suitable for all Pressures of Steam, Oil and Acids.
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HOISTING ENGINES
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AND
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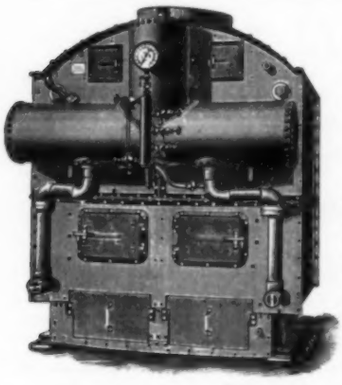

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PATENT SECTIONAL WATER TUBE BOILERS

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Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

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It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive No priming, and easy to manage.

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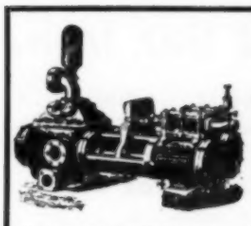
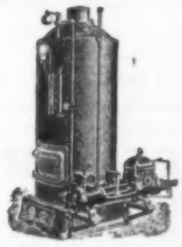


WORTHINGTON STEAM. . . PUMPS. . .



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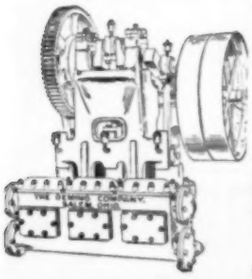

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SINGLE AND DOUBLE-ACTING CYLINDERS.

Unequaled in Design and Construction.

Adapted for Water Works, Hydraulic Elevators, Boiler Feeding, Apartment Houses, Mine Pumping, Irrigation, Paper Mills, Refineries, Breweries, Etc. MADE BY

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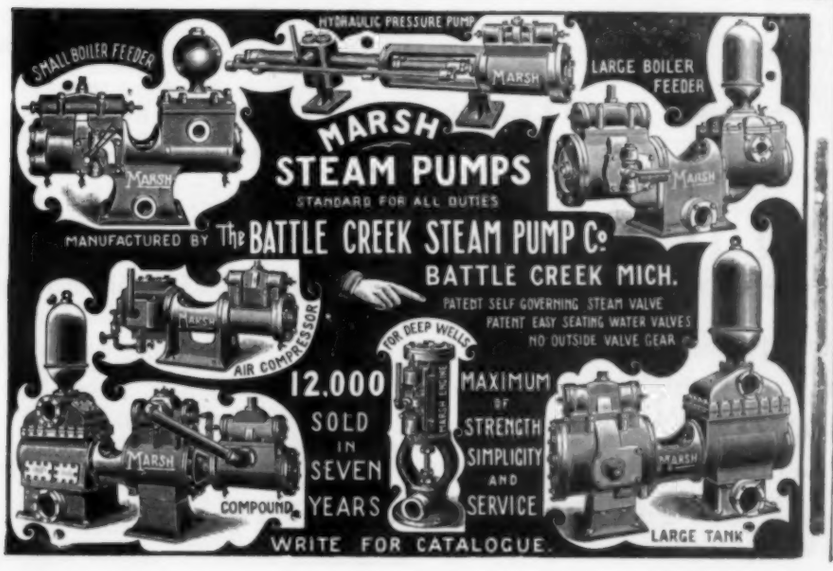

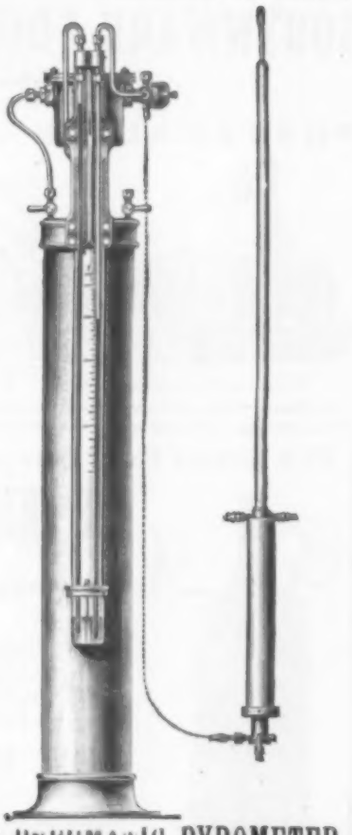

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Stationary and Portable.

SENSITIVE, ACCURATE AND DURABLE TO

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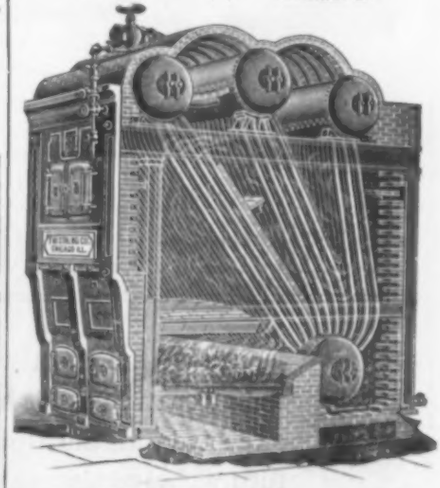
Over 350,000 H. P. In use. || Write for Catalogue I.



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Branches in all Principal Cities

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SOLE MAKERS OF THE

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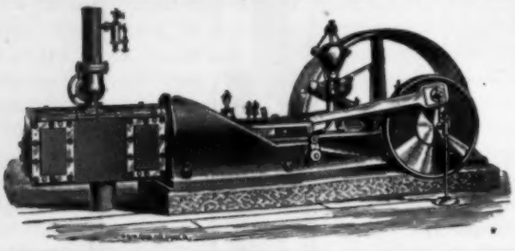

FEATURES OF THIS ENGINE
Simplicity of Design,
Highest Economy of Steam,
Close Regulation of Speed,
Minimum Floor Space.

ALSO BUILDERS OF
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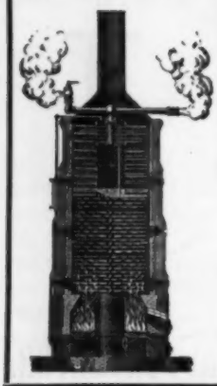
Counter-Current Condensers.

The Great Coal Saver and Producer of Dry Steam.



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THE PIONEER VERTICAL WATER-TUBE BOILER
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16 Years' Unequalled Record for Economy, Safety and Durability.

No Explosions or Accidents of Any Kind.

CORRESPONDENCE SOLICITED.

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Telephone 1229, 18th St. N. Y. GENERAL OFFICE:
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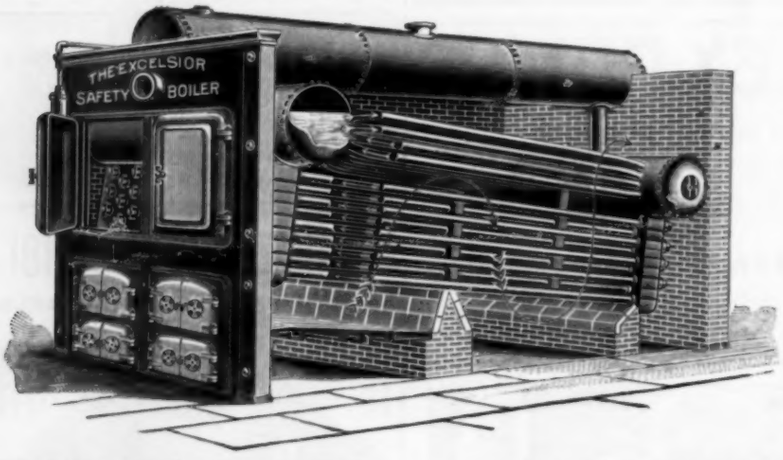
EXCELSIOR SAFETY BOILERS.

In producing this boiler we have been governed by the three best elements in design—Simplicity, Accessibility and Strength. We have endeavored to make a boiler so simple that any Engineer or Fireman having ordinary knowledge of steam can understand and operate it. And at the same time should any part get out of order the man in charge can examine and repair it.
They cannot be excelled for Safety and Economy.



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Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

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EDWIN HARRINGTON, SON & CO., INC.,

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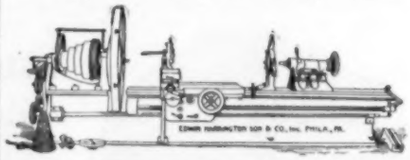
MANUFACTURERS OF Iron-Working Tools.



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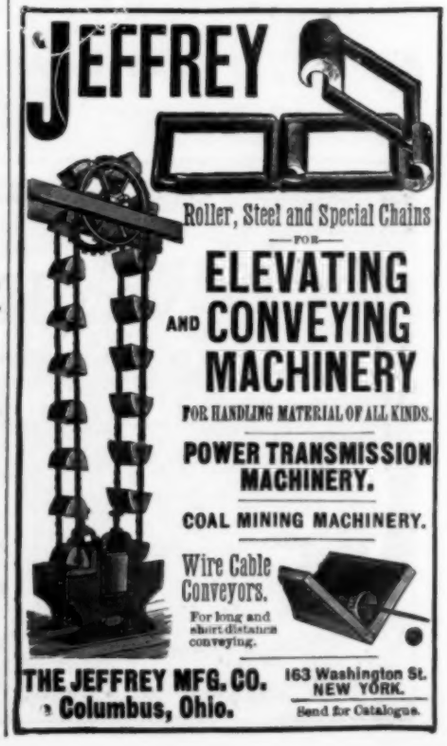

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ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

COAL MINING MACHINERY.

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For long and short distance conveying.

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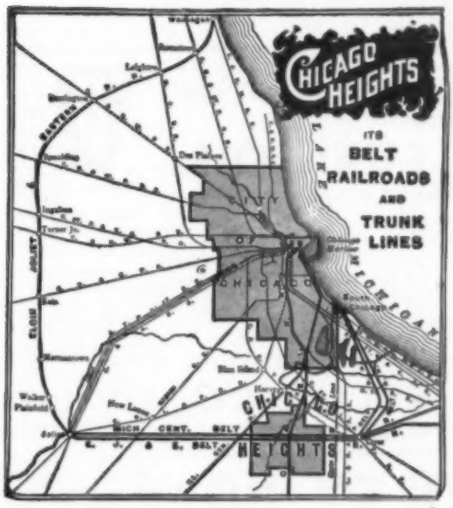
Don't continue in the old rut and rust out.
Be progressive—keep in touch with the times.

Move to Chicago Heights

where you can reduce the cost of production and cheaply distribute the product of the factory to the consumer.



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Chicago Freight Rates.

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THE LARGEST REAL ESTATE FIRM IN AMERICA.

Capital Paid in $1,250,000.00.

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MANUFACTURERS OF

Seamless Steel Tubes,

For Hydraulic Tubes, Jacks, Presses and Hoists, Lathe Spindles, Bicycle Hub Stock Projectiles, Hollow Shafting, Shells for Carbonic Acid and other Gases, Piston and Valve Rods, Axles, Bolts and Columns, Working Barrels, Roller Bearings, Bushings, Couplings, Boiler Tubes and other purposes where

Strength, Uniformity and Durability

ARE REQUIRED.

Our tubes are hot drawn, without weld or seam; from the best quality of steel, in lengths from 8 to 25 feet, and of any degree of hardness, from .08 to .60 carbon —They are equal in every respect, except finish, to cold drawn tubes and are offered at a much lower price.

For special work, requiring extremely low sulphur and phosphorus, we are prepared to guarantee a maximum of

.020 SULPHUR and .015 PHOSPHORUS.

The following Sales Agencies will be pleased to supply any additional information that may be desired, viz:

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Wm. J. Haines & Co.,
906 Filbert Street, Philadelphia.
Henry L. Coe,
727 Garfield Bldg., Cleveland.
Kellogg Weldless Tube Co.,
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M. T. Miles & Son,
317 and 318 Western Union Bldg., Chicago.
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FURNACES, FLASKS, FOUNDRY Supplies and Specialties.

Send for our Catalogue and look at the Ribbed Flask.

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If you are thinking of enlarging your mill, foundry or machine shop, or of purchasing machinery of any kind, send us a line giving character of machinery needed. We can put you in communication with manufacturers from whom you can buy advantageously.

IMPROVED DUPLEX SYSTEM
- - - FOR - - -
BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS SATISFACTION GUARANTEED.

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Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

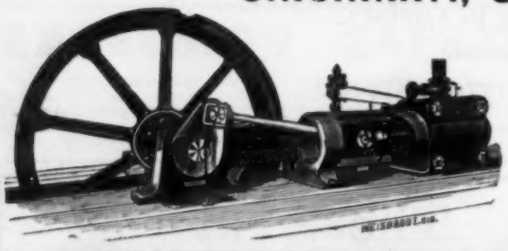
THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

THE LANE & BODLEY CO.,
CINCINNATI, OHIO.



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ALL SIZES.
Simple and Compound.
Shafting, Hangers, Pulleys.
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Valley Jctn. & Way Stations	*6:30 P M	*7:10A M
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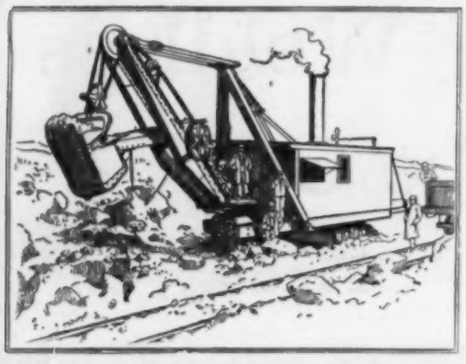
Akron, Canton & Chicago	*8:10 A M	*6:30 P
Akron, Canton & Worcester, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.



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DREDGING MACHINES	More than 20 sizes in all types. Dipper, Elevator Hydraulic, to suit any requirements.
GOLD SAVING MACHINERY	For Placer Mining. With steam shovels and appliances for disposal of tailings.
WRECKING CRANES	Hand or Steam, 5 to 35 tons capacity. Also Locomotive Cranes and Pile-Drivers.
CENTRIFUGAL DREDGING PUMPS	6-inch to 36-inch. With either simple, compound or triple engines.

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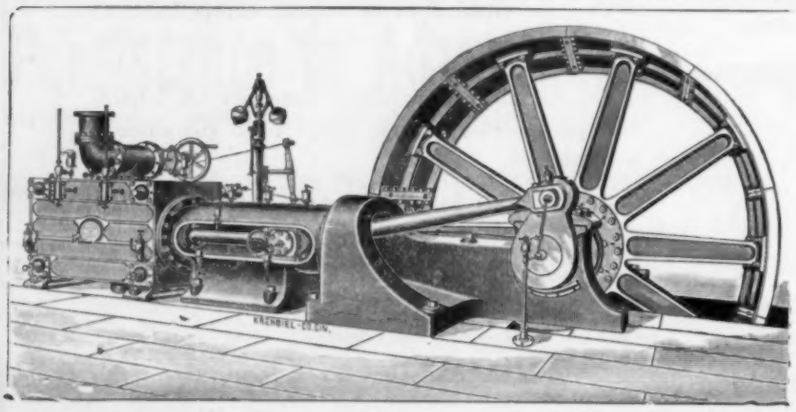
THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



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Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

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39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
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C. C. MOORE & CO., SAN FRANCISCO, CAL.

LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

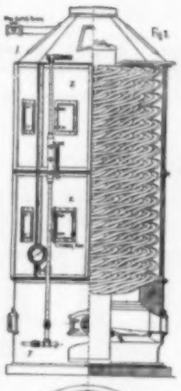
A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y.
425 Old Colony Bldg., CHICAGO, ILL.

The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony,

THE CLONBROCK STEAM BOILER CO.,

BROOKLYN, N. Y.



MANUFACTURERS OF

THE MORRIN "CLIMAX" AND "COMPOUND"

WATER TUBE BOILERS

No Screw Joints. No Metallic Joints. No Ground Joints. No Packing Joints. No Cast Iron Pipes. Manifolds or Headers to cause trouble from Unequal Expansion or Contraction.

Quick and Steady Steamers,
Positive Circulation.

THE "CLIMAX" IS BUILT IN UNITS OF 50 TO 1,000 H. P
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☞ Caution: Beware of Infringers, they will be rigidly prosecuted.

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WORKS.

Galvanizing in all its branches. Highest prices paid for new Scrap Zinc. When in the market for Pump Chains and Rubber Buckets write us for prices.

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MANUFACTURERS OF

Standard Tubular, Fire Box, Vertical and Submerged Tube Steel

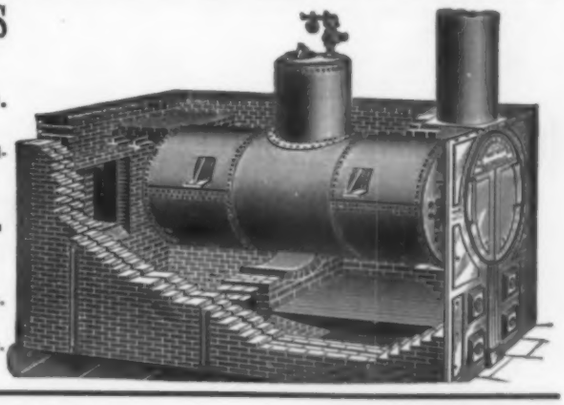
BOILERS.

For Stationary, Portable, or Marine use.

Also of TANKS of all kinds.

Smokestacks, etc.,
Grey Iron Castings.

Write for Prices and Terms.



Being in the boiler business

For a long time,

We have learned that **HEATING SURFACE** does not always mean **HORSE POWER;**

It depends upon getting the HEAT to the SURFACE.

We have also learned that the only way to make a HIGH GRADE article, and sell it for about the same price as an ordinary one, is to concentrate our WHOLE PLANT and ENERGIES upon ONE ARTICLE—

THE TUBULAR STEAM BOILER.

Write us for Prices and Specifications. You need not unload the goods off the car if not as represented.

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Richmond, Ind.

R. D. NUTTALL CO.,

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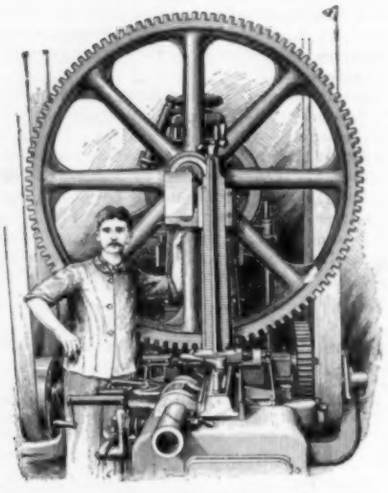
All Kinds of

GEAR CUTTING

AND

Fine Machine Work



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GENERAL ELECTRIC COMPANY

Electrical Apparatus

FOR THE ECONOMICAL OPERATION OF

Iron and Steel Mills, Engine Shops, Factories of all kinds, Mines, etc.

WATER-POWERS UTILIZED.

ESTIMATES AND PRICES ON APPLICATION.

Main Office, SCHENECTADY, N. Y.

Sales Offices in all large Cities in United States. Foreign Department, 44 Broad Street, New York.

The "MONEY QUESTION" is what the financiers are worrying about but **GOOD FOUNDRY IRONS** is the question which interests the foundrymen.

STOP THAT LOSS DUE TO BAD CASTINGS

BY USING

CLINTON AND HECTOR

Inspected Foundry Pig Irons

For Softness, Strength, Fluidity and Uniformity

CLINTON IRON & STEEL CO.,

Furnaces: Pittsburg, Pa. New York Office, No. 15 Cortlandt Street.

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

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All sizes carried in stock by The W. Bingham Co., Cleveland, Ohio.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

NOTE THESE FACTS.

By the use of John Adt's Aut. Wire Straightening and Cutting Machines, Elastic Rotary Blow Riveting Machines and Tools, we have raised the standard of our work and increased our sales, for by their modern construction and time saving devices, the great production and good quality of work has enabled us to quote prices by which our customers would buy in large quantities.

Riveting Machine.

Others say they would have none other than John Adt's Machines and Tools. (This is the good news we are continually receiving.)

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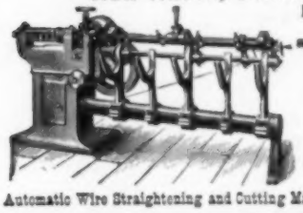
New Haven, Conn.



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THE 1896 EDITION

OF THE

Iron and Steel Directory

Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.

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Dead Stroke Hammer, 40 pound.
Planer, Cigar Box, 8 in.
Exhaust Fan, 12 in. outlet.
Exhaust Fan, Sturtevant's No. 8.
8 Spindle Drill, for butt hinges.
Milling Machine for butt hinges.
Nut Taper, 5 spindle.
Full set Wagon Skein Patterns.
Full set Machines for finishing Wagon Skeins.
8 Spindle Drilling Machine, horizontal.
4 Spindle " " upright.
6 Spindle " " horizontal.
Sash Pulley Polishing Machine.
Complete set Sash Pulley Patterns and machinery
John Adt Riveter. (for finishing.
Trip Hammer Riveter.
Set Screw Machine.
Upright Boring Mill, for Pulleys.
Boring Mill, for pulleys, 8 in. 16 ft. long.
10 h. p. Upright Boiler Injector and piping.
Double Head Automatic Riveter, for Castors.
20 Moulding Machines, for iron castings.
Fay Jig Saw.
Lathe, 5 ft. x 16 in. swing, screw cutting.
Lathe, 15 ft. x 16 in. swing, not screw cutting.
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The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony.

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The Lane & Bodley Co., Cincinnati, O.

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Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
Sharpless & Winchell, Minneapolis, Minn.
O. Textor, Cleveland, O
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Fessenden & Ridinger, Pittsburg, Pa.

Anti-Friction Metal—
C. H. Besly & Co., Chicago, Ill.
North American Metaline Co., Long Island City, N. Y.
Magnolia Metal Co., New York City, N. Y.

Babbitt Metal—
C. H. Besly & Co., Chicago, Ill.

Belting—
C. H. Besly & Co., Chicago, Ill.

Blacksmith and Carriage Supplies—
C. H. Besly & Co., Chicago, Ill.

Blowers—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

Blast Furnace Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.

Boilers and Boiler Attachments—
Wm. B. Pollock & Co., Youngstown, O
S. Freeman & Sons Mfg. Co., Racine, Wis.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Fulton Steam Boiler Wks. & Fdy., Richmond Ind.
The Hazelton Boiler Co., New York.
The Stirling Co., Chicago, Ill.
Clonbrock Steam Boiler Co., Brooklyn, N. Y.
Harrison Safety Boiler Works, Philadelphia.
Lane & Bodley Co., Cincinnati, O.
Meehan Boiler Co., New Castle, Pa.
Almy Water Tube Boiler Co., Providence, R. I.

Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Boiler Fronts and Fittings—
Vulcan Iron Works Co., Toledo, O.
The Lane & Bodley Co., Cincinnati, O.

Boiler Tubes—
S. Fix Sons, Cleveland.

Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.

Bolts and Nuts—
Upson Nut Co., Cleveland, O.

Boring and Turning Mills—
H. Bickford, Lakeport, N. H.

Brass Castings—
Nolte Brass Co., Springfield, O.

Brass Work (Special Finished)—
Nolte Brass Co., Springfield, O.

Bridges—
Berlin Iron Bridge Co., East Berlin, Conn.
Shiffler Bridge Co., Pittsburg.

Buildings (Steel Frame.)—
Berlin Iron Bridge Co., East Berlin, Conn.
Shiffler Bridge Co., Pittsburg.

Carbon Points—
Jeffrey Mfg. Co., Columbus, O.

Castings—
Lorain Foundry Co., Lorain, O.

Castings (Brass)—
Nolte Brass Co., Springfield, O.

Chain Hoists—
Moore Mfg. Co., Milwaukee, Wis.

Chemists—
Dickman & MacKenzie, Chicago, Ill.
F. A. Emmerton, Cleveland, O.
Sharpless & Winchell, Minneapolis, Minn.
O. Textor, Cleveland, O.
Robert W. Hunt & Co., Chicago, Ill.

Chilled and Sand Rolls—
The Lloyd-Booth Co., Youngstown, O.
Wm. Tod & Co., Youngstown, O.

Clamps—
The Jas. L. Haven Co., Cincinnati, O.

Coal and Coke—
Forster, Waterbury & Co., Chicago, Ill.
C. K. Pittman, Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.

Core Compound—
National Jeloluse Co., New York City.

Corrugated Iron—
The Cincinnati Corrugating Co., Piqua, O.
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Conveyors—
Jeffrey Mfg. Co., Columbus, O.

Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
American Hoist & Derrick Co., St. Paul, Minn.
Marion Steam Shovel Co., Marion, O.
Addyston Pipe & Steel Co., Cincinnati, O.
Brown Hoisting & Conveying Machine Co., Cleveland, O.
Edwin Harrington, Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee Wis.

Damper Regulators—
Hine & Robertson Co., New York.

Dies—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.

Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Drill Presses—
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.

Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Dry Kilns—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Dynamos—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.

Eave Troughs and Conductors—
Berger Mfg. Co., Canton, O.
The Cincinnati Corrugating Co., Piqua, O.

Electrical Supplies—
Westinghouse Electric & Mfg. Co , Pittsburg
General Electric Co., Schenectady, N. Y.

Elevators—
The Lane & Bodley Co., Cincinnati, O.

Emery and Corundum Wheels—
J. Wendell Cole, Columbus and Chicago.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Sterling Emery Wheel Mfg. Co., Tiffin, O.
Diamond Machine Co., Providence, R. I.

Engineers and Contractors—
Robert W. Hunt & Co., Chicago, Ill.
Wellman Seaver Engineering Co., Cleveland, O.
Fessenden & Ridinger, Pittsburg, Pa,
Edward E. Erikson, Pittsburg, Pa.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
H. Channon Co., Chicago, Ill.
Jenkins Bros., New York City.

Engravers and Electrotypers—
Cleveland Electrotype Co., Cleveland, O.

Engines (Gas)—
Otto Gas Engine Works, Philadelphia, Pa.
The Prouty Co., Chicago, Ill.

Engine Packing—
C. H. Besly & Co., Chicago, Ill.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co.
Buffalo Forge Co., Buffalo, N. Y.
Lane & Bodley Co. Cincinnati, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.
Buffalo Forge Co. Buffalo, N. Y.

Exhaust Heads—
Hine & Robertson Co., New York.

Factory Sites—
Chicago Heights Land Association, Chicago.

Fans—
Buffalo Forge Co., Buffalo N. Y.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters—
Hine & Robertson Co., New York.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Westmoreland Fire Brick Co., Pittsburg, Pa.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Stowe, Fuller & Co., Cleveland, O.
Dover Fire Brick Co., Cleveland.
F. B. Stevens, Detroit, Mich
Stuart Fire Brick Co., Pittsburg, Pa.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flasks—
Brass Founders' Supply Co., Newark, N. J.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati.

Foundries—
Taylor & Boggis Foundry Co., Cleveland, O.
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
The Rippel Mfg. Co., Mt. Gilead, O.
S. Freeman & Sons Mfg. Co., Racine, Wis.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
East Chicago Foundry Co., Chicago.

Foundry Supplies—
Newport Sand Bank Co., Newport, Ky.
T. P. Kelley & Co., New York City.
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
F. B. Stevens, Detroit, Mich.
National Jeloluse Co., New York City.
Brass Founders' Supply Co., Newark, N. J.
The Ohio Sand Co., Conneaut, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.
American Smokeless Furnace Co., Cleveland, O

Friction Metal—
Magnolia Metal Co., New York City, N. Y.

Furnaces—
Brightman Furnace Co., Cleveland, O.
American Smokeless Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.
American Fire Brick & Clay Co., Mineral Pt., O.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
The Cincinnati Corrugating Co., Piqua, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
Taylor & Boggis Foundry Co., Cleveland, O.
Kurtz & Buhrer, Foundry Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.

Heating and Ventilating Apparatus—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Berlin Iron Bridge Co., East Berlin, Conn.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

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Condit-Fuller Co., Cleveland.
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Junction Iron & Steel Co., Mingo Junction, O.
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The Cincinnati Corrugating Co., Piqua, O.
Cambria Iron Co., Johnstown, Pa.
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Pickands, Brown & Co., Chicago, Ill.

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Iron Working Tools—
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Lathes—
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U. Baird Machinery Co., Pittsburg, Pa.
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U. Baird Machinery Co., Pittsburg, Pa.
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Lodge & Shipley Machine Tool Co., Cincinnati.
Dietz, Schumacher & Boye, Cincinnati, O.

Machine Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
Atwood & M'Caffrey, Pittsburg, Pa.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Malleable Castings—
The Jas. L. Haven Co., Cincinnati, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metallic Lath—
The Cincinnati Corrugating Co., Piqua, O.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Motors—
Westinghouse Electric & Mfg. Co., Pittsburg.
General Electric Co., Schenectady, N. Y.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Newport Sand Bank Co., Newport, Ky.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

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W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.

Oil Extractors—
Hine & Robertson Co., New York.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.

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Jenkins Bros., New York City.
Hine & Robertson Co., New York.

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Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.

Pattern Leather Fillet—
Canton Leather Fillet Co., Canton, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

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U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

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Polishing Machines—
Diamond Machine Co., Providence, R. I.

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Cady Mfg. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Atwood & M'Caffrey, Pittsburg, Pa.
Henry R. Worthington, Brooklyn, N. Y.
Hughes Steam Pump Co., Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Uehling, Steinbart & Co., Ltd., Newark, N. J.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Rolling Mill Supplies—
Atwood & M'Caffrey, Pittsburg, Pa.

Roofs—
Berlin Iron Bridge Co., East Berlin, Conn.
The Cincinnati Corrugating Co., Piqua, O.
Shiffler Bridge Co., Pittsburg.

Roofing Plates—
The Cincinnati Corrugating Co., Piqua, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Screws—
Illinois Screw Co., Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.

Second-Hand Machinery—
The Jas. L. Haven Co., Cincinnati, O.

Shafting—
Finished Steel Co., Youngstown, O.
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Long & Allstatter Co., Hamilton, O.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Berger Bros., Philadelphia, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co. Piqua, O.
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Cady Mfg. Co., Cleveland, O.
Edwin Harrington Son & Co., Philadelphia.

Skylights—
Translucent Fabric Co., Quincy, Mass.

Stamping and Punching—
Cady Mfg. Co., Cleveland, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O
Marion Steam Shovel Co., Marion, O.

Steam Separators—
Hine & Robertson Co., New York.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
The Sargent Co., Chicago, Ill.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Ficharty & Co., Cleveland.

Steel Shafting—
Finished Steel Co., Youngstown, O.

Steel Tanks—
Berlin Iron Bridge Co., East Berlin, Conn.

Stokers—
Playford Stoker Co., Cleveland, O.
American Smokeless Furnace Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.

Structural Engineers—
Berlin Iron Bridge Co., East Berlin, Conn.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Central Iron & Steel Co., Brasil, Ind.

Tanks—
S. Freeman & Sons Mfg. Co., Racine, Wis.
Enterprise Boiler Co., Youngstown, O.

Tinning Machinery—
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Atlanta Steel & Tin Plate Co., Atlanta, Ind.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Cincinnati Corrugating Co., Piqua, O.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.

Tube Welding—
S. Pix Sons, Cleveland.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

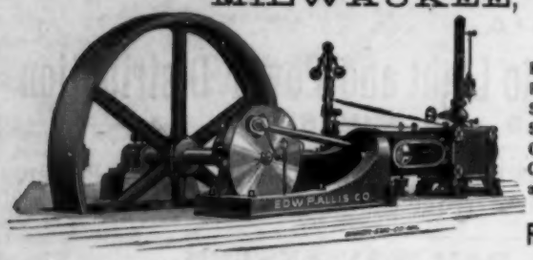
Vises—
The Jas. L. Haven Co., Cincinnati, O.

Wire Rope—
American Hoist & Derrick Co., St.

Wire Machinery—
Cady Mfg. Co., Cleveland, O.
John Adt & Son, New Haven Conn.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO, PITTSBURG.

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When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	$4.50@4.75
No. 1 Bessemer hematite	4.00@4.25
Hematites No. 1 non-Bessemer	2.25@2.50
No 1. Specular, non-Bessemer	2.75@3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$11 00@11 40
No. 1 Strong Foundry	11 65@12 15
No. 2 Strong Foundry	11 25@11 40
No. 1 Gray Forge, red short	9 90@10 15
No. 2 Gray Forge, neutral	... ... 10 25
No. 1 American Scotch	... ... 12 25
No. 2 American Scotch	... ... 11 75
Lake Superior Charcoal	... ... 13 50
PITTSBURG:	
No. 1 Foundry	$11 75@12 00
No. 2 Foundry	11 00@11 50
Gray Forge	9 65@9 75
White and Mottled	... ... 10 00
Warm Blast Charcoal	15 00@16 00
Cold Blast Charcoal	... ... 20 00
Bessemer	11 00@11 25
CHICAGO:	
Lake Superior Charcoal	$13 50@$14 00
Local Coke Foundry No. 1	11 75@12 25
Local Coke Foundry No. 2	11 25@11 75
Local Coke Foundry No. 3	11 00@11 25
Local Scotch Foundry No. 1	11 75@12 25
Local Scotch Foundry No. 2	11 25@11 75
Local Scotch Foundry No. 3	11 00@11 25
Southern Coke No. 1	11 65@11 90
Southern Coke No. 2	11 15@11 40
Southern Coke No. 3	10 90@11 40
Southern No. 1 Soft	11 40@11 65
Southern No. 2 Soft	10 90@11 40
Southern Silveries No. 1	12 15@12 65
Southern Silveries No. 2	11 65@12 15
Jackson Co. Silveries	14 00@16 05
Ohio Silveries No. 1	15 00@15 55
Ohio Silveries No. 2	14 50@15 05
Ohio Strong Softeners	14 00@14 28
Alabama Car Wheel	16 65@17 15
Malleable Bessemer	12 75@13 50
Coke Bessemer	13 00@13 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$10 75@11 00
Southern Coke No. 2 and No. 1 Soft	10 25@10 50
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	15 00@16 00
Tennessee Charcoal No 1	13 00@14 00
Jackson County Silvery No 1	13 50@14 00
Southern Coke, Gray Forge	... ... 9 25
" " Mottled	... ... 9 25
Standard Alabama Car Wheel	14 75@15 50
Tennessee " "	13 50@14 50
Lake Superior " "	14 75@15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$12 25@12 50
No. 2 Foundry Strong Coke Iron Lake Superior Ore	11 75@12 00
Ohio Strong Softener No. 1	12 35@12 60
Jackson Co. Silvery No. 1	14 25@15 25
Lake Superior Charcoal	13 50@14 50
Southern Soft No. 1	12 25@11 40
Hanging Rock Charcoal	... ... 17 00
ST. LOUIS (reported by Rogers, Brown & Meacham):	
Southern Coke No 1	$... ...$11 50
Southern Coke No. 2	... ... 11 00
Southern Coke No. 3	... ... 10 50
Southern Gray Forge	... ... 10 25
Southern Charcoal No. 1	... ... 15 00
Missouri Charcoal No. 1	14 00@14 00
Ohio Softeners	... ... 15 00
Lake Superior Car W	... ... 15 25
Southern Car Wheel	... ... 15 75

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$15 00
Old steel rails	12 00
Old car wheels	12 50
	NET TONS
No. 1 R. R. wrought scrap	$12 50
Mill scrap	9 00
No. 1 Machine cast scrap	9 00
Iron axles	16 00
Axle turnings	8 00
Wrought turnings (free from cast)	7 50
Cast borings	6 00
Uncut wrought iron boilers	5 00
Steel boiler plates	9 00
Grate bars	6 00
Pipes and flues (clean)	8 50
Tank iron	8 50
Hoop and band iron	6 50
Sheet iron	5 00
Wrought drillings	7 00
Malleable iron	10 00

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.63c
Angles	1.25c
Tees	1.40c
Universal Plates	1.20@1.25c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅜	1.20 Base.
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20